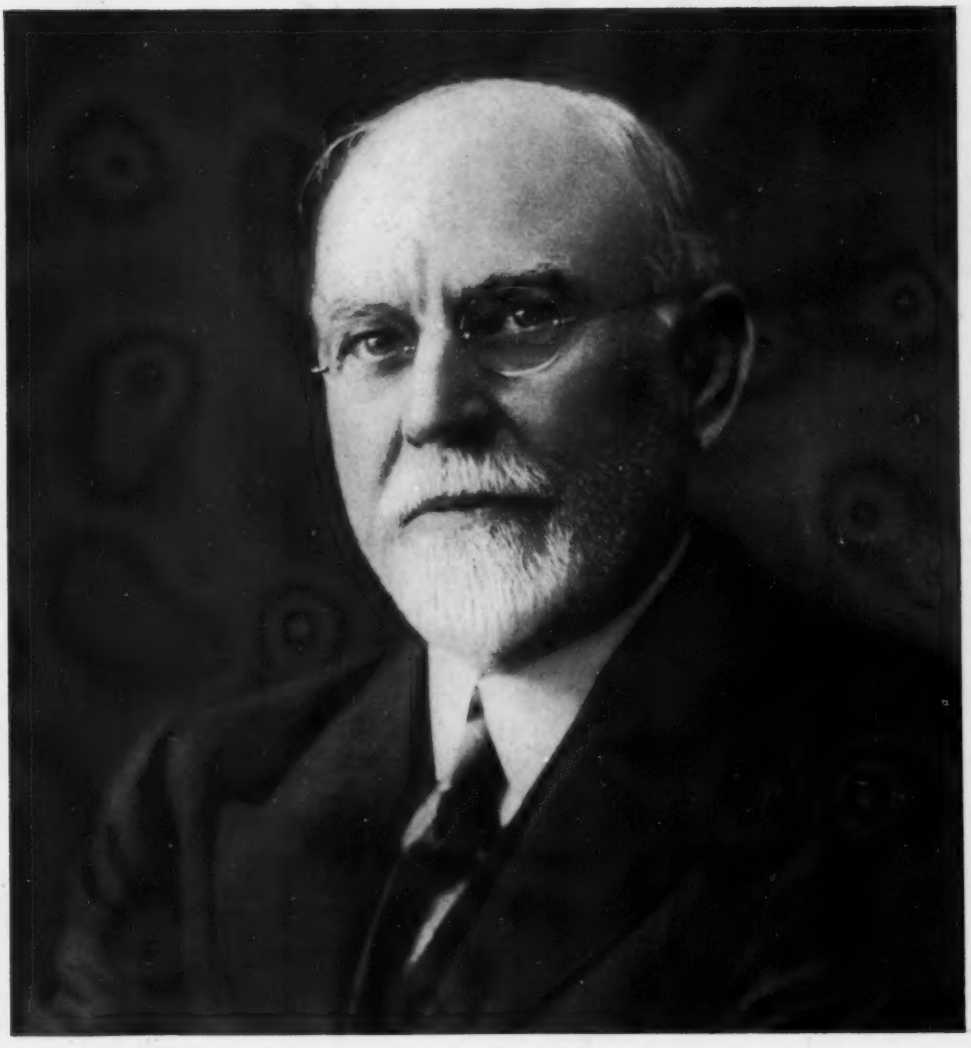
Electrical World

FEBRUARY 28, 1948



James H. McGraw, 1860-1948

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Electrical World

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TRIPLE-PURPOSE OKONITE-ENGINEERED CABLE

• Power, as well as carrier current control and communication between this crib in Lake Okeechobee and treatment plant are supplied by an Okolite cable (shown below).

Unique power feeder also furnishes operational control and communication

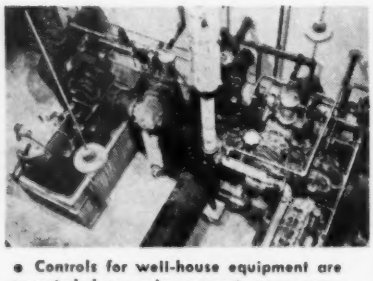
Though Lake Okeechobee in Florida provided the millions of gallons of water needed in its operations, the U. S. Sugar Corporation had to build a treatment plant to purify the water. Nearly 7 miles, however, separated the plant from the water-bound intake crib in the lake.

Power for the pumps and equipment was to be supplied by a three-conductor 5000-volt submarine cable originating at the treatment plant. It was also necessary to use remote control for operating the well-house machinery.

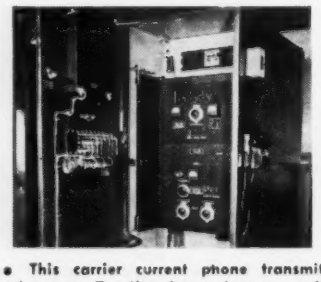
Okonite engineers were consulted and their studies showed that by proper design it was possible to combine a three-fold function in one cable. This was accomplished through the use of Okolite high-voltage insulation whose electrical characteristics permitted carrier current to be superimposed on the power conductors.

Result: An Okolite-insulated cable — armored with steel wire for the 4½-mile submarine section and with a non-metallic sheath for the 2½-mile buried section on shore — now supplies not only power and operational control but also carries a communication circuit whose talking qualities equal that of a regular telephone line.

"Unusual" cable installations have a way of turning out to be Okonite. Problem solving is our business. Why not talk over your cable problem with an Okonite engineer? The Okonite Company, Passaic, New Jersey.



• Controls for well-house equipment are operated by carrier current over same conductors that supply power to pumps.



• This carrier current phone transmits voice over 7 miles from plant to well-house over the three-phase power cable.

• End view of barge and rig ready to lay submarine section of triple-purpose Okolite power cable described above.

OKONITE SINCE 1878 insulated wires and cables

THE BEST CABLE IS YOUR BEST POLICY

James H. McGraw — 1860-1948

ENTWINED in the life of almost any man who ever stood out from the mass of his fellows can be found a more or less substantial body of legend. So it is with James H. McGraw, founder of the McGraw-Hill Publishing Co.

An intriguing part of the legend which grew up around him was a remark attributed to his associates. They maintained that Mr McGraw always had "a remarkably high standard of dissatisfaction." Nowhere else in the legend of the man is there so revealing a portrait.

Dissatisfaction, in one sense, was a keynote of his times. There was so much dissatisfaction with things as they were during this man's era. He was born to a national dissatisfaction with the economic rivalry between North and South. He matured in an era of political dissatisfaction which saw the then-strange doctrines of Populism.

Throughout industrial America, which he came to know so well, there was strong dissatisfaction in this man's time. There was the dissatisfaction with iron which was advancing the art of steel making and using. There was dissatisfaction with existing forms of industrial organization—with its limited specialization, with its relatively small accumulations of capital, with its lack of integration.

One of the greatest national dissatisfactions, even though it may not have been recognized as such, was that with existing sources of power. Within this man's lifetime—and aided considerably by him—the world's greatest electrical industry was born and grew to be a foundation stone of the world's greatest industrial economy.

Mr McGraw's business career ended during an era of intense political dissatisfaction. That was in 1935, when the most far-reaching political and economic reform of several generations was in full swing. Indeed, his life ended amid world dissatisfaction, the product of two world wars, perhaps forerunner of a third.

Within his own field—publishing—he was an apostle of dissatisfaction. Business publishing of the day had little to recommend it. He transformed business papers from puff sheets to standard works. In advertising and circulation practices, he worked broad changes. He was dissatisfied with careless advertising. He was dissatisfied with phoney circulation claims. Truth in each of these is accepted today. That they are is due at least in part to his dissatisfaction with anything less.

So it was also in editorial performance. The man was dissatisfied with editorial isolation. He was satisfied only when his editors kept closely in touch with the industries of which they wrote. He was dissatisfied unless they participated in the activities of their industries. As a result, the world today is richer—materially and spiritually—to the extent that it uses and needs competent business publishing.

This is the enduring personal monument of James H. McGraw.

★ ★ NEWS OF THE

Big Electric Manufacturers Avoid Finish Fight with UE

Will Not Bring Up Failure of Union to Comply with Taft-Hartley Act—Action Removes One Likely Cause for Strikes —Bargaining with Westinghouse Will Begin Next Week

MAJOR COMPANIES in the electrical manufacturing industry unanimously have declined an opportunity for a finish fight with the "left-wing" United Electrical, Radio & Machine Workers.

All such companies either have agreed not to raise the issue of UE de-certification under the Taft-Hartley Act for at least one more year, or they have permitted the deadline for doing so to pass without action.

This policy does not automatically preclude all possibility of strikes in the industry this year. But it does preclude the possibility of strikes over the issue of de-certification. Having refused steadfastly to file non-Communist affidavits with NLRB UE's officers have prevented the union from using NLRB facilities. Had electrical manufacturers chosen to do so, they could have invoked the same procedure as Remington Rand did some months ago. Outcome of that legal maneuver was construed as equivalent to UE de-certification there.

The decision by electrical manufacturers not to press this issue this year does not preclude such action next year, assuming the Taft-Hartley Act is not amended in the interim. It is believed that the decision was reached, partially, at least because the industry is loaded with orders and wants to insure, as far as possible, another year of uninterrupted production.

Westinghouse Electric Corp and UE will get down to serious bargaining in New York next week with the pressure of a March 31 contract deadline.

The corporation and UE agreed during preliminary bargaining sessions in Pittsburgh early this month to waive any right to terminate their contract this year. The contract would have expired March 31. This means the contract will run another year, at least, with any changes probably made effective April 1.

This does not preclude a strike against Westinghouse over higher wages and other proposed changes in the contract, since the union will be free to strike.

On the right of a non-complying union to represent workers, NLRB has made two policy decisions. Both hurt the UE and other non-compliers. In the Remington Rand case, it refused to entertain a company petition seeking to determine whether the UE still represented a majority of the Remington Rand workers. This was construed as the equivalent of "de-certification" of the UE.

In another case, affecting the status of the CIO Steel Workers at Harris Foundry & Machine Co, Cordele, Ga., NLRB accepted a de-certification petition filed by a group of employees. The union, although not in compliance with the Taft-Hartley Act, was ordered placed on the ballot to determine whether the Harris Foundry employees still wanted to be represented by the union.

Thus, in any plant where the UE or other non-complying union has bargaining rights, the way is open for either the employer or a group of workers to challenge the union's status.

McGraw Funeral Held

Funeral services for James H. McGraw, founder of the McGraw-Hill Publishing Co, were held Thursday afternoon (Feb 26) at the Central Presbyterian Church, New York City. Services were conducted by the Rev Tom Fuhr, assistant pastor, assisted by the Rev John Parks of the Presbyterian Church of Madison, N. J. Interment plans have not yet been disclosed.

In recognition of this threat, UE has diligently given priority to obtaining management agreement for extension of the union contract and continued recognition of the union. This it did with Westinghouse and just this week, with Phelps Dodge Copper Products Corp, Elizabeth, N. J.

The Phelps Dodge contract was to expire March 8. Not only was it extended two weeks in advance, but wage negotiations were put off until after April 1, thus bringing negotiations in line with other major UE contracts.

An ulterior purpose behind this technique is to keep other companies from following Remington Rand's example so as to isolate that company's action as one not approved by most of the industry.

Westinghouse Policy in Line

The policy of Westinghouse in dealing with non-complying unions is in line with that of the U. S. Steel Corp, and perhaps many others. It flows, really, from past policy, which is that the company will recognize any union that holds a certification from NLRB as exclusive bargaining agent. All UE locals dealing with Westinghouse meet that condition.

Under this policy, however, these unions will not be able to obtain recognition for new bargaining units and will not be able to defend their status in existing units if it is challenged in an NLRB election by a complying union.

UE's demand for a raise to compensate for a $13.03 loss in real weekly wages since Jan. 1, 1945, evidently is going to be tested first against Westinghouse.

The recess preceding next week's sessions has offered a chance to observe the effect of the break in the grain market. Unless the break indicates a general trend, there will be no weakening of the union's demands. This was emphasized this week by CIO President Philip Murray who said he saw no evidence of a downward trend in living costs.

This is the situation on other UE contracts: General Electric expires March 31, General Motors (Electrical Division) expires April 28, and Allis-Chalmers agreements with UE cover Boston, Pittsburgh and Norwood plants, and expire at different times.

FPC under Fire in Congress; Action Depends on Truman

Opposition of Senator O'Mahoney to Behling Appointment to Commission Starts Controversy—Aroused Senators Irked by Proposed Amendments to the Natural Gas Act

CRITICISM OF THE division within the Federal Power Commission over natural gas regulation mounted in Congressional circles this week. No further action is expected from the capitol, however, until the President makes clear his views on the protest of Sen. Joseph C. O'Mahoney (EW, Feb 21, Page 12).

Meanwhile, the O'Mahoney letter to the White House, which demanded withdrawal of the nomination of Burton N. Behling as an FPC member, aroused a storm of controversy. The Wyoming Senator blasted Behling for his support of proposed Natural Gas Act amendments submitted to a Senate committee by FPC. Committee members requested the Commission proposals as a possible compromise for the Rizley Bill, which would drastically revise the act.

Democrats and a number of liberal Republican Senators aligned themselves with O'Mahoney in opposition to any amendment. These sources also strongly hinted that they would oppose the renomination of Commissioner Harrington Wimberly, whose term expires in June. Wimberly and Chairman Nelson Lee Smith, together with Behling, endorsed the disputed Gas Act amendment proposals before a Congressional committee. Commissioners Leland Olds and Claude Draper opposed them.

In brief, the Smith-Wimberly recommendations would allow a regulated natural gas company credit in its rate base for the "fair" field value of gas produced by the company or its affiliates. The proposals also would reaffirm the unregulated status of independent gas producers, and effect less important revisions in technical language of the Act.

The Rizley Bill, which, in effect, would limit FPC jurisdiction to actual interstate pipe line transportation of gas, passed the House last year. An identical measure, introduced by Sen E. H. Moore, Oklahoma Republican, has been stalled before a Senate Committee.

Objective of the principal Smith-Wimberly recommendation is to allow interstate pipe line companies the commodity value of their own gas. Under this proposal, FPC would abandon the original cost-accounting principle with respect to pie line gas production facilities. Instead, it would consider production activities separately, setting a "fair" field price for such gas on the basis of prices received by independent producers for gas of a similar type in the same or comparable production areas.

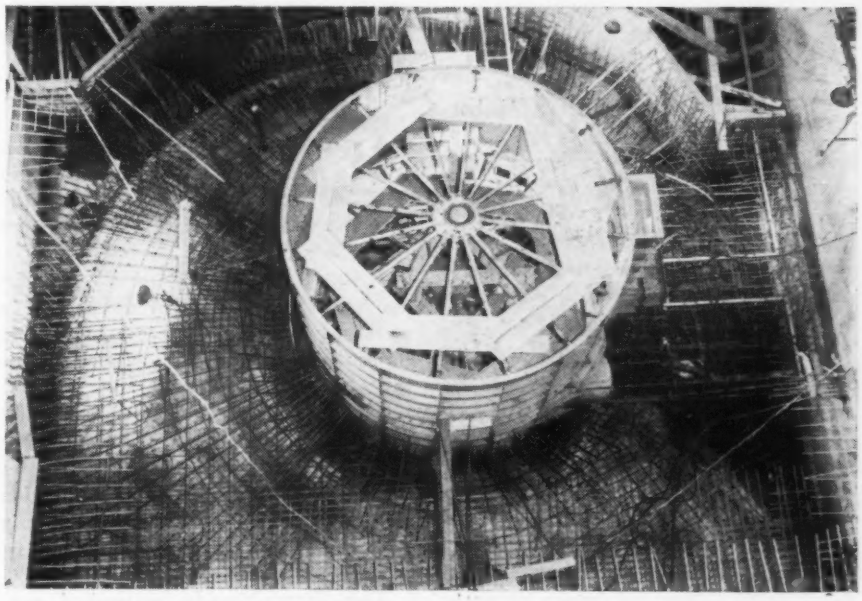
Cost of this gas would be accounted for as an operating expense, just as is the fuel now purchased by regulated companies from independent producers. All other functions of the companies would be subject to original cost accounting.

Both FPC and gas industry spokesmen conceded that allowance to pipe line companies of field prices for their gas might result in some increase in retail gas rates. They contended, however, that the increase would be slight —one or two cents at the most. Commissioner Olds, on the other hand, contended that the cost would be "enormous." Both he and Commissioner Draper held that the Gas Act had proven satisfactory in its present form. No regulated gas company has been losing money, Olds asserted.

These are indications that the cost of natural gas to the consumer—both residential and industrial—is going to rise anyhow. Independent producers, who are backing the Rizley Bill, already are demanding, and receiving, higher prices from the pipe line companies, according to FPC and industry surveys.

Observers attributed this rise in field prices to growing competition for gas in the production areas, principally the Southwest. Further, competition among pipe line companies themselves, which are planning to double their transportation facilities as fast as steel pipe becomes available, has improved the bargaining position of the producer.

Producers want FPC to drop original cost accounting for pipe line produc-



THIS SPIDERWEB is the reinforcing steel at Pit No. 1 of the power plant at the Keswick Dam in California's Central Valley. The unit will be 25,000 kw

tion activities because they claim that it has had a depressing effect on all field prices of gas. Some producers also are reported reluctant to sign new gas supply contracts with the pipe line companies until legislation to effect this reform has been acted upon.

Since pipe line companies and their affiliates produce only about half the gas they transport, they could easily be squeezed if independent suppliers withhold their fuel. An alternative—and one which reportedly has been considered by some companies—would be for the pipe line operators to dispose of all their reserves and production facilities.

Where the price of gas to the consumer will level off is impossible to predict. Field prices probably cannot soar much higher than those received in the high-cost production areas of Pennsylvania and West Virginia. Pennsylvania producers received 24.5 cents per thousand cu ft for their fuel in 1945. This same gas was transported and sold at consumer rates appreciably below the cost of coal and oil equivalents.

It is hardly possible that gas from the Southwest will approach such price levels. High transportation costs to consumer centers in the East and Midwest would make the fuel non-competitive with coal if the price jumped more than a few cents. Further, the competitive situation in the Southwest, where most of the 8,000 gas producers operate, would tend to keep field prices at a lower level than those in the Appalachian area. Consumer rates can rise only to 45 cents per thousand cu ft before they overtake the cost of equivalent coal and oil.

•

Over the Dam Twice

The Lower Colorado River Authority has ordered equipment for pumping back the waters of Buchanan Lake so that they can be used over again for the generation of power. The scheme involves using 1.8 kw of energy, worth about 4 mills at night, to generate 1 kw of energy the following day when it is worth 8 mills. The idea is not new. It has been used in New England and in Europe.

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Must Get FPC License

New York Power & Light Corp has been ordered by the Federal Power Commission to apply for a license under the Federal Power Act for its Stewarts Bridge hydroelectric project on the Sacandaga River.

Drought in California Brings Compulsory Rationing Threat

PUC Considering Emergency Measures as Water Supplies Grow Less—San Francisco Shuts Down Generator—PG&E also Pinched—Snow Pack Reported as Lowest on Record

CALIFORNIA LAST WEEK remained in the grip of a drought that threatened to bring compulsory rationing of power for both domestic and commercial use.

Gov Earl Warren revealed that the Public Utilities Commission was considering emergency measures to meet the problem including daylight saving time, a statewide brownout, and the appointment of a state power administrator "if all other methods fail."

The state twice before has enforced power rationing, in 1924 and 1931.

In San Francisco, Utilities Manager James H. Turner announced that electric power production at the city's 80,000-kw generating plant at Moccasin Creek has been cut one-third to meet an acute water shortage.

"Although there is plenty of water on hand for all domestic uses, we have enough at Moccasin Creek to last only 10 days for electric power," Turner said. "Therefore, it seems the wisest course to cut out one generator now and stretch out the available water as long as we can."

The Moccasin plant supplies San Francisco's municipal lighting and street railway and sells power to the Turlock-Modesto Irrigation District and a Bay area cement plant. Its reservoir, with a capacity of 117,300,000,000 gal, currently is down to 12,000,000,000 gal.

PG&E Will Do Its Best

A spokesman for Pacific Gas & Electric Co said that the utility would do its "best" to replace any power deficiency under its standby agreement with the city.

Meanwhile, PG&E reported an average overall reduction of 5 percent in peak use of electricity resulting from public cooperation in a voluntary curtailment plan.

Pinched by a shortage of rain that not only has cut its water reserves but also has resulted in a heavy power drain through unseasonal irrigation pumping, the company is suffering a power shortage that is expected to last "many months."

The Sierra-Nevada watershed covered by PG&E's hydroelectric system has recorded precipitation as low as 21 percent of normal in the south to 91 percent in the extreme northern end of the state. The snow pack is the lowest on record.

Heavy snows also are needed in Oregon to bring irrigation water supplies up to normal in that state, the first snow survey of the winter disclosed. The snow pack there ranges from 69 to 87 percent of normal.

The Mountain States Power Co has asked industrial plants near Springfield, Ore, to operate on staggered shifts to conserve power supplies. If the plan operates successfully it will be extended to all the industrial areas in the state served by the company.

California Oregon Power Co is also suffering from a short power supply following the curtailment of power deliveries from PG&E made for the last year under a long-time reciprocal agreement. Previously the flow had been from north to south.

•

Los Angeles Strike Ends as City Gets Injunction

A court order on Feb 15 ended a 10-day strike of AFL building trades unionists on $50,000,000 worth of construction projects of the Los Angeles City Power Department. Workers went back to the job Feb 16 under an order of Superior Judge Clarence M. Hanson. More than 350 building trades unionists and some 575 civil service workers were back on the job. A hearing was scheduled in the Los Angeles Superior Court on the question of making the order permanent.

Attorneys for the Municipal Department of Water and Power obtained the restraining order on the ground that continuation of the strike would threaten Los Angeles with a shortage of water and power.

Attorney Arthur Garrett, representing the Building Trades Council, said the unions would abide by the decision but would fight the injunction action in court.

The Building Trades Council voted the strike on Feb 4 and the walkout started two days later.

Accident Prevention Stressed as Employee Morale Builder

EEI Committee Told of Safety Developments in Electric Utility Industry—Deaths in Live-Line Operations Placed on Improper Procedure—Use of Various Ladders Discussed

A GOOD ACCIDENT prevention program is a strong builder of employee morale C. B. Boulet of Wisconsin Public Service Corp told the EEI Accident Prevention Committee meeting in Pittsburgh on Feb 16 and 17. He is chairman of the EEI Industrial Relations Committee and had told of its scope and activities in seeking the collaboration of the safety group.

The assured liaison will mean closer correlation of safety principles in the testing, selection, and assignment of employees so they will think safely and work safely. Much of the discussion here and throughout the sessions focussed on the rising importance of the psychology and attitude of employees and their supervisors.

A surprising item introduced by D. C. Stewart, Buffalo Niagara Electric Corp, was the report of 16 deaths in 1941-1946 of crew members engaged in live-line operations. He said all were due to improper procedure and none to defective tools. Details indicated that the largest single cause was carelessness in unwrapping tie-wires.

Pressure for uninterrupted service over 6.9-kv lines (particularly rural) is prompting the use of so-called 20-kv gloves, in some cases in connection with insulated platforms.

PP&L Perfecting Guard

To erect new full-length treated poles to replace deteriorated poles on 22 and 66-kv lines, Pennsylvania Power & Light Co, according to P. L. G. Hasskarl, is perfecting a guard consisting of four 18-foot sections of switchstick to prevent wire contact with the pole. Buffalo Niagara Electric Corp is experimenting with molded insulation over the metal of climbing irons. Concensus was against regaffing after hearing of some metallographic examinations by the Consolidated Gas, Electric Light & Power Co of Baltimore of broken irons.

Booms, derricks, and cranes were discussed in terms of the most feasible and effective way of publicizing the contact hazards. Ordinances and statutes were not in heavy favor. G. S. Diehl said the Baltimore utility's patrolmen were supplied with 500 reprints of ELECTRICAL WORLD's Dec 20, 1947 page dealing with the hazards in condensed manner. Even television antennas have been added to the "reach-into" class, there having been electrocution in a recent instance of contact.

Rubber protective equipment is nearly up to pre-war standards, said T. R. Claffey, W. H. Salisbury Co. He added that only natural rubber is used in the manufacture. Neoprene coating is still under study from the standpoint of flexibility and corona-resistance. Two utilities are trying out a new flexible raincoat, and a new yellow pigment is available for high visibility raincoats, he said.

Safe use of ladders was the subject of a sound-film prepared by C. B. Boulet for use on the Wisconsin Public Service system. Joseph Witt showed a movie of the use of a lashed aluminum ladder for reaching comealongs and armor rods on a high voltage river-crossing deadend on the Duquesne Light system. Several other utilities reported inability to get sufficiently sound wooden ladders and a consequent adoption of aluminum ladders. The doubled or tripled life readily justifies the greater cost. it was said. Duquesne Light uses combination extension ladders with wood in the top section in work on live lines.

Study of established methods of resuscitation was urged by W. R. Smith, Public Service Electric & Gas Co, Newark, to determine whether a modification (massage, pressure, countershock, drugs) could stop ventricular fibrillation and save more lives.

In the absence of E. C. Rue, Boston Edison Co, A. L. Dowden of Liberty Mutual Insurance mentioned initial steps toward providing visual aids for educating the public (especially school children) on how to avoid electrical hazards and for educating operators about accidents in power plants. There has been a disturbing increase in steam station mishaps.

Moves to enlist line hardware manufacturers' support in standardized packaging are meeting success said G. E. Balch of Duquesne Light in a report on shop and storeroom hazard. Crates, barrels, kegs, nailed boxes, bags will largely be replaced by substantial boxes of practically uniform dimensions and of weight capable of handling by a single employee. Pallet loading and lift-truck stacking are increasing in vogue for both safety and space economy.

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Higher Rates Spurned

Henderson, Ind., would like its leading manufacturers to accept voluntarily an increase in their power rates. The city claims they are getting power for less than the cost of its manufacture. The manufacturers have refused.

BRITAIN's utilities are getting coal this year. This is the stockpile of the Battersea Plant at London. A year ago, the stockpile was nearly exhausted

SYSTEM OPERATORS of Pennsylvania gathered in Reading, last week, for the regular winter meeting of the PEA Systems Operations Committee. Left to right, seated, W. H. Doran, executive vice-president, Metropolitan Edison Co; H. W. Phillips, Pennsylvania-New Jersey Interconnection and chairman of the Systems Operations Committee; H. M. Rankin, chief engineer, Metropolitan Edison. Standing, A. T. Deck, Metropolitan Edison; W. H. Jones, Philadelphia Electric Co; and W. C. Bryson, Duquesne Light Co

Utilities Must Increase Efficiency, Cut Expenses to Achieve Higher Earnings

If utilities are to achieve higher earnings under today's conditions, they must use every possible resource to increase the efficiency of their operations and cut expenses, W. H. Doran, executive vice-president of Metropolitan Edison Co, said last week.

Speaking before the System Operations Committee of the Pennsylvania Electric Association at Reading, Doran warned that the cost of fuel, labor, construction materials, and money today stands at near peak levels. Utilities, on the other hand, are charging their customers less than half the rates of 20 years ago.

The course to higher earnings, today, lies in the direction of higher and higher operating efficiency—lower and lower operating costs. Utility operations must concentrate on this goal, he said.

One of the ways that costs can be reduced, Doran stated, is through the use of newer equipment designed for economy. Another is for system operators to handle equipment maintenance so that needed machines are out of service a minimum number of hours. In this way need for purchasing power to handle loads will be cut and expenses further reduced.

At a luncheon meeting, A. J. Althouse, assistant to the president of Metropolitan Edison Co, warned that if the upward trend in operating costs is not arrested or turned down, it may lead to higher charges for service. Althouse pointed out that competition by other industries for construction materials is keeping utility systems "physically starved" and contributing to the high cost of new construction. While needed new facilities are being built to supply the mounting demand, utilities are being forced to operate older, less efficient generating plants having high operating costs or, in some cases, buy power from other utilities.

Gain to be derived from under-excited operation of modern generators far outweigh the difficulties, C. G. Adams, General Electric Co, stated. With modern high power factor machines, it is often desirable to operate in the leading power factor region, during light load, to supply some of the systems reactive requirements. Such under-excited operation brings savings in capacitor equipment, eliminates the need for switching distribution capacitors and the need for issuing special switching operations on the system.

Stability-wise Adams, knew of no instance where a modern machine with a modern voltage regulator pulled out of step under steady-state conditions when under-excited. Transient stability problems are adequately taken care of by modern high-speed breaker and relay operating times. However, he warned against using machines of 1925 vintage in the leading region because of their predisposition toward dangerous heating.

J. C. Cunningham, Westinghouse Electric Corp, presented a demonstration of principal factors in system stability by means of an ingenious mechanical vector analogy.

R. M. Youtz, Pennsylvania Water & Power Co, presented an interim report on station maintenance problems and procedures. Conclusion of accompanying discussion was that data was too limited to correlate machine outage and exposure. The study will continue.

•

Ontario Prays for Rain to End Power Shortage

They were praying in Southern Ontario this week—praying for an early spring thaw in Northern Ontario and Northern Quebec that would end the most severe power shortage ever to hit a metropolitan section in North America.

Since last December, the Ontario Hydro-Electric Power Commission has been issuing warnings. Power usage must be curtailed. We may have to ration power. Municipalities paid little heed. No precautions were taken.

Lack of rain last fall reduced the amount of water in storage. Rivers were frozen over. In Quebec, week by week, power suppliers were reducing the energy going to serve Ontario's 25-cycle district. Finally, the cuts had their effect.

Ontario Hydro ordered the municipalities to make severe cuts in usage. The warnings reached the city systems Friday the thirteenth. By Monday, (Feb 16), municipal authorities had found only one solution: pull switches.

Hardest hit was Toronto (pop. 700,000). Without any warning, power in the city was shut off three times, twice for 30-minute periods, once for 15 minutes. Although every section was not affected simultaneously, each got the same treatment. That set the pattern which is still in vogue for the rest of the territory and for Toronto. However, Toronto was soon down to only two 30-minute shutoffs a day. The rest of the province was more fortunate. Some towns were without power only a few minutes each day. But all shared in Ontario Hydro's order to cut consumption to 90 percent of last October's.

The favorite way has been to reduce consumption voluntarily. Store lighting, street lighting, and other "unnecessary load" were first victims. Shifting of work hours and reduction of power to industries were popular second choices.

Co-ops Blamed, REA Praised by Rural Line Contractors

Incompetent Engineering and Poor Business Tactics Laid to Co-op Management—REA's Financial and Engineering Divisions Lauded—Wickard Offers to Cooperate with RECA

THE CO-OPS GOT the blame and REA the praise as the Rural Electrical Contractors Association held its annual meeting recently at Chicago.

Co-ops were blamed for incompetent engineering and material take-off by their engineers, poor business tactics, constant bid rejection and re-bidding of projects, and delayed payments on work estimates and completed projects (up to six months or more). These defects, forum discussion revealed, has led many contractors to by-pass REA work "until such time as the work will be handled in a business-like manner."

Contractors are refusing to bid on projects since they have no assurance that the "low-bidder" will get the job. They are reluctant to rebid when they have already given their best price. A further complaint is that they are tired of becoming bankers by having their money tied up by slow payments.

REA's engineering and financial divisions in Washington were praised for their clear cut specifications and prompt clearance of payment requests. REA Administrator Claude Wickard indicated that REA can't do much to remove the "bottleneck" at co-op level. Congress is now complaining that REA is too dictatorial.

Wickard All Cooperation

In contrast with the past, the Administrator was all cooperation. He asked for patience and tolerance, invited them to bring their gripes to Washington, and indicated RECA would be consulted on future policy changes. Regarding "force account" work (co-ops building their own lines), Wickard would like to see contractors build all future lines.

Discussing the slow payment problem, D. W. Baker, REA finance division, said some co-op managers never read their construction contracts. Thus they never know what their obligations are insofar as contractors' payments are concerned. He proposed that his office issue specific instructions detailing the necessary steps to requisition funds and push through payments.

The contractors also came in for a share of criticism. Edward Dye, Laramore & Douglass, Inc, Chicago, a consulting engineering firm, asserted contractors neglect to make prompt final inventory reports and have substandard supervision on line work.

CONGRATULATIONS of William Cagney, left, retiring RECA president, go to his successor, R. E. Mattison

Presenting the co-ops' side of the picture, Clyde Ellis, National Rural Electrical Cooperative Association, said the co-ops feel the contractors are too slow. He cited statistics to show that the contractors now build 0.3 miles of line a day against a pre-war average of about a mile. J. K. O'Shaughnessy, REA's chief engineer, supported this criticism. He also said the contractors have poor planning and supervision and can't complete contracts on time.

New officers are R. E. Mattison, R. E. Mattison & Co, Oklahoma City, president; P. F. Size, Miller Construction Co, Linton, Ind., treasurer; and R. S. Shely, Shely Construction Co, Lexington, Ky., secretary. The three vice-presidents are W. A. Patterson, W. A. Patterson Co, St. Paul; E. C. Bridges, Heath Springs, S. C.; and Larry Ellett, Agutter Electric Co, Seattle.

•

Utility Will Build Plant

Potomac Edison Co will build a 38,000-kw steam electric generating plant at Riverton, Va., on the Shenandoah River. The construction will permit eventual expansion to 152,000 kw.

Instrument Panel Lighting Perturbs PEA Engineers

Lighting of station instrument panels and the status of inhibited insulating oil for power transformers were discussed at a meeting of the Pennsylvania Electric Association's Electrical Equipment Committee Feb 19 and 20, in New Castle. The entire group visited the nearby transformer plant of Westinghouse at Sharon on the second day.

Opening a discussion of control room lighting, Chairman J. S. Brown, Duquesne Light Co, said the most promising form of instrument panel illumination was direct external illumination of the dials in conjunction with good general lighting. He felt that the instrument cases should be shaped to function with high angle lighting. A symposium on the subject is contemplated for the next meeting.

Sewaren Dials Tilted Forward

It was stated by D. W. Taylor that Public Service Electric & Gas Co's Sewaren station instruments will have the dials tilted forward and a "window" above. He rued the wide diversity in shapes, sizes, and projection of boiler room instruments.

The new Barbadoes station of Philadelphia Electric, according to B. R. Nevins, is planning to install a completely luminous ceiling of synthetic material.

Wider right of way was a lesson learned by at least one Pennsylvania utility during the January 2 ice storm. Another fact brought to light was that there were many more freezers on the lines than were known to the company.

A new silver plating process involving only the use of a powder, water and a cloth was mentioned. Several member companies plan trials.

Differ on Inhibited Oil

Difference of opinion regarding use of inhibited oil in power transformers was manifest but the majority were on the negative or lukewarm side. Vice-Chairman R. E. Neidig, Metropolitan Edison, said his company would not use it without concurrence of the transformer manufacturer. He then read a statement from General Electric stating that gains indicated by studies to date have been uncertain, that mixing greatly reduces the effect of inhibited oil, and that deterioration proceeds rapidly once it has started. R. J. Salsbury, Duquesne Light, said the availability of gas or sealed atmosphere lessens the possible importance of inhibition.

More Shasta Dam Power Soon but Who Will Get It?

A deadlock between the Bureau of Reclamation and Pacific Gas & Electric Co in contract negotiations for delivery of power from Shasta Dam, last week threatened to block utilization of 35,000 out of 75,000 kw which is to be available at Shasta early in March. The energy is to come from one of two generators returned from war service at Grand Coulee. The second is expected to be in service in June.

The Bureau declares that only 40,000 kw of the new supply will be available to ease California's power emergency because of a "lack of transmission facilities." The Bureau has no transmission lines to distribute the power.

President James B. Black of PG&E, however, informed the Bureau that his company "was prepared to take immediately whatever additional power you can deliver to us." He implied that the company was willing to accept any temporary line overload necessary to deliver the full new supply.

Director Richard L. Boke at Sacramento explained the negotiations had been deadlocked on a "preference to public agencies clause." The Bureau, he said, "now seeks only to clarify the existing contract provision on this subject" to comply with Reclamation law.

"The company has consistently refused to recognize any obligation under this contract provision and has declined even to deliver power for the Bureau to federal establishments . . . and likewise has refused requests to deliver to other public agencies such as the City of Roseville," he said.

Roseville, in 1945, signed a contract with the Bureau of power deliveries from Shasta if and when they would become available. Since then it has been purchasing power from PG&E on a month-to-month basis at a rate higher than it previously paid.

The utility has agreed to deliver power for Central Valley project work but has consistently refused to interpret the contract as requiring it to supply power to build up competitive public agencies.

President Black maintained that the "power can be made available by a mere letter amendment to the existing agreement."

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Another PUD Operating

The Pend Oreille Public Utility District of Newport, Wash., became the twenty-second operating PUD in the state, Feb 6, when it began taking Bonneville Power Administration power to serve Metaline and the nearby Grandview mine. It also shortly will begin to serve Ione which has voted to sell its municipal diesel system to the Public Utility District.

•

Christoffel Perjury Trial Opens in Federal Court

The perjury trial of Harold R. Christoffel, alleged Communist labor leader in Milwaukee, opened in Washington last week before a jury in the Federal District Court.

Christoffel is honorary president of Local 248 of the CIO, United Automobile Workers, which pulled a strike against Allis-Chalmers in 1941 to hinder production for the Navy at a time when the Communists were sabotaging the American defense program.

Christoffel is accused on six counts of perjuring himself when he told the House Labor Committee last March that he was not and had never been a Communist.

The government stated at the outset of the trial that it would prove, among other things, that Christoffel was a member of the Communist Party and of the Communist Political Association.

SEC RULINGS

DALLAS POWER & LIGHT Co's amended application covering the submission of certain proposed charter amendments to the holders of its outstanding preferred stock has been approved. The proposal covers (1) modification of the present charter provision pertaining to the issuance of unsecured indebtedness; (2) elimination of the provision requiring an affirmative two-thirds vote of Dallas 4½ percent preferred stock in order to create or authorize new stock ranking on a parity with the 4½ percent preferred stock; (3) elimination of the provision requiring a majority vote of the 4½ percent preferred stock in order to increase the total authorized amount of such stock; and (4) clarification of the term "capitalization" as used in the charter provision imposing a restriction on the payment of common stock dividends. (Release No. 7978).

•

Small Municipal Bought

Illinois Power Co has purchased the municipal electric property of Patoka, Marion County, for $32,500. The existing plant, driven by an oil engine, will be dismanteled. The 270 customers in the village will pay the standard rates of the company which are 17 percent lower than those they had been paying.

MEETINGS

PREVIOUSLY LISTED

American Society of Mechanical Engineers—Spring Meeting, St. Charles Hotel, New Orleans, March 1-4.

Electric League of Western Pennsylvania—Planned Lighting Exposition and Conference, William Penn Hotel, Pittsburgh, March 1-4.

National Association of Purchasing Agents—Public Utility Buyers' Group, Mid-Winter Conference, Roosevelt Hotel, New Orleans, March 8-9.

National Rural Electric Cooperative Association—Annual Meeting, Stevens Hotel, Chicago, March 8-10.

Oklahoma Utilities Association—Annual Convention, Biltmore Hotel, Oklahoma City, Okla., March 11-12.

National Electrical Manufacturers Association—Winter Convention, Edgewater Beach Hotel, Chicago, March 14-18.

Canadian Electrical Association—Western Conference, Palliser Hotel, Calgary, March 15-17.

Institute of Radio Engineers—Annual Convention, Hotel Commodore, and Radio Engineering Show, Grand Central Palace, New York, March 22-25.

American Institute of Electrical Engineers—Conference on Electron Tubes for Instrumentation and Industrial Use, sponsored by the Joint Subcommittee on Electronic Instruments, Benjamin Franklin Hotel, Philadelphia, March 29-31; Great Lakes District Meeting, Fort Des Moines Hotel, Des Moines, Iowa, April 1-3; North Eastern District Meeting, Taft Hotel, New Haven, Conn., April 28-30; Summer General Meeting, Palace of Fine Arts, Mexico City, Mex., June 21-25.

Southeastern Electric Exchange—Accounting Conference, Henry Grady Hotel, Atlanta, April 1-2; Annual Meeting, Boca Raton, Fla., April 8-10; Spring Conference, Engineering and Operating Section, Tampa Terrace Hotel, Tampa, Fla., May 6-7.

National Association of Corrosion Engineers—Annual Conference and Exhibition, Jefferson Hotel, St. Louis, April 5-8.

Edison Electric Institute—Annual Sales Conference, Edgewater Beach Hotel, Chicago, April 6-8; Annual Convention, Hotel Traymore, Atlantic City, June 1-3.

Missouri Valley Electric Association—Engineering Conference, President Hotel, Kansas City, April 7-8; Rural Round Table, President Hotel, Kansas City, May 5; Sales and Rural Conference, President Hotel, Kansas City, May 6-7

Midwest Power Conference—Sheraton Hotel, Chicago, April 7-9.

Northwest Electric Light & Power Association—Engineering and Operation Section, Davenport Hotel, Spokane, April 14-16; Accounting and Business Practice Section, Davenport Hotel, Spokane, April 17-18; Annual Business Meeting, Empress Hotel, Victoria, B. C., May 10; Business Development Section, Empress Hotel, Victoria, B. C., May 10-12.

Electrochemical Society—Spring Congress, Deshler-Wallick Hotel, Columbus, Ohio, April 14-17.

Missouri Association of Public Utilities—Annual Convention, Hotel Jefferson, St. Louis, April 28-30.

Engineers Club of Philadelphia—Engineering Progress Show, co-sponsored by junior members and the Franklin Institute at the Institute, May 11-16.

Public Utilities Advertising Association—Annual Meeting, Hotel Cleveland, Cleveland, Ohio, May 27-28.

Co-op Denies Being Utility to Avoid Labor Arbitration

Is the Dairyland Power Cooperative a public utility? That's the question the Circuit Court at Madison, Wis., is trying to answer. Basically, no one in the case cares whether or not the co-op is a utility. The present problem is the state's anti-utility strike law.

Co-op employees, members of IBEW, have applied for the compulsory arbitration services of the Wisconsin Employment Relations Board. This is in accord with provisions of the anti-strike law.

Dairyland has asked the court to restrain the Board. The co-op claims that it is not a public utility. It doesn't and never has sold energy to anyone but its members. The law, therefore, does not apply.

Assistant Attorney General Beatrice Lampert has another story. The Legislature did not exempt co-ops from the provisions of the act. "When any substantial part of the population receives electrical energy, the person responsible for that service must be classed as a public utility employer responsible to the public."

She pointed out how substantial Dairyland is—47,000 customers in 23 counties served by 757 miles of transmission lines.

Judge Alvin Reis has the restraining motion under advisement.

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Seattle Contractors Plead Innocent to U. S. Charges

The Seattle Electrical Contractors Association, five corporations, and 12 individuals have entered pleas of innocent in U. S. District Court at Seattle to charges of conspiring to set prices in the electrical contracting field (EW, Jan 31, page 39).

R. D. Horning, manager of the Association, in a telegram to Attorney General Tom Clark, asserted that special agents investigating the case "supplemented false documentary evidence with three added charges taken out of the old NRA code which has not been used for ten years."

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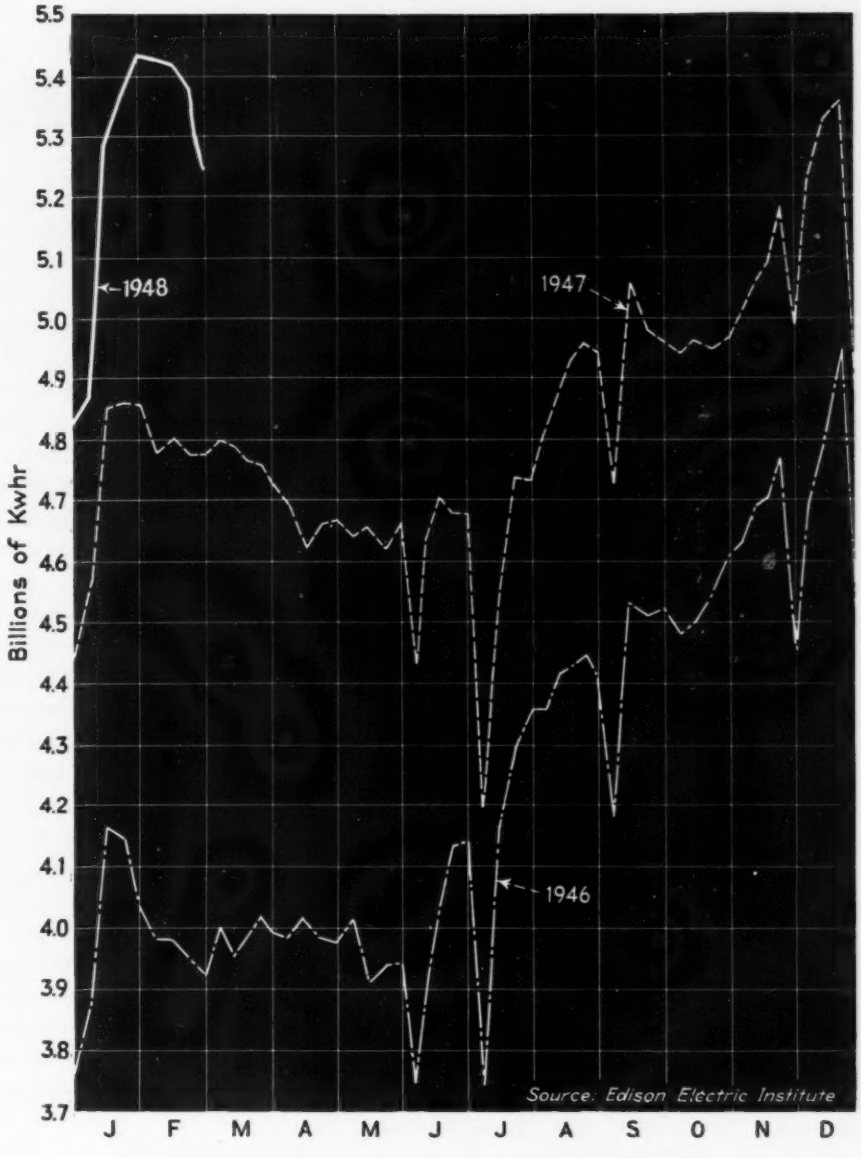
Will Add 40,000-Kw Unit

Mississippi Power & Light Co will add a 40,000-kw unit to its Rex Brown Plant whose first unit will not go into operation until this summer. The new unit will be of the outdoor type with gas-fired boilers, supplemented by stand-by oil equipment.



Arput Makes All Birds Rainbirds

ARPUT, our ink-stained-wretch-in-charge-of-kwhr-output, is ingenious. This week, his brainstorm is a rainstorm—to ease the water shortage now pestering the utilities.

"Right now," says Arput, "all the birds are down South. Why don't we attach dry ice dispensers to them? They could seed every cloud they pass on the way North. Think of the rain."

ARPUT is untroubled by the fact that this interstate operation probably would put the birds under FPC jurisdiction. "FPC ought to get the bird," he croaked, adding: "The output? That went down again this week."

Weekly Output, Millions Kwhr

1948		1947		1946	
Feb. 21	5,254	Feb. 22	4,778	Feb. 23	3,923
Feb. 14	5,385	Feb. 15	4,778	Feb. 16	3,949
Feb. 7	5,412	Feb. 8	4,801	Feb. 9	3,983
Jan. 31	5,429	Feb. 1	4,777	Feb. 2	3,983
Jan. 24	5,436	Jan. 25	4,856	Jan. 26	4,034
Jan. 17	5,370	Jan. 18	4,857	Jan. 19	4,145
Jan. 10	5,278	Jan. 11	4,853	Jan. 12	4,163
Jan. 3	4,868	Jan. 4	4,574	Jan. 5	3,865
1947		1946		1945	
Dec. 27	4,830	Dec. 28	4,442	Dec. 29	3,759

Percent Change from Previous Year

	Feb. 21	Feb. 14	Feb. 7
New England	+ 9.5	+12.6	+11.5
Mid-Atlantic	+ 5.2	+ 9.1	+ 8.2
Central Industrial	+ 7.6	+10.8	+ 9.8
West Central	+10.3	+12.8	+14.5
Southern States	+11.4	+14.4	+16.5
Rocky Mountain	+14.8	+17.1	+15.0
Pacific Coast	+17.8	+17.4	+18.0
Total United States.	+10.0	+12.7	+12.7

Other News

New Equipment . . . . Page	98
News About People	111
Manufacturers & Markets	120
Recent Rate Changes	123
Construction	124

James H. McGraw, A Pioneer

James H. McGraw died Feb 21 at his home in San Francisco. He was 87 years old.

His death followed several years of illness and came a dozen years after his retirement as chairman of the board of directors of the McGraw-Hill Publishing Co, of which he was founder. Surviving him are his widow, the former Mildred F. Whittlesey, a daughter, Mrs John E. Osmun, of Madison, N. J., and four sons. They are James H. McGraw, Jr, president and chairman of the board of the McGraw-Hill Publishing Co, Inc; Curtis W., senior vice-president and treasurer; Donald C., vice-president in charge of manufacturing, and Harold W., president of the McGraw-Hill Building Corp, at 330 W. 42nd Street, New York.

James H. McGraw was born at Panama, Chautauqua County, N. Y. on Dec 17, 1860. He attended State Normal School at Fredonia, N. Y., while teaching at a district school. He was graduated by Fredonia as valedictorian of his class in 1884. Thereupon, he became principal of the district school at which he had taught. Although he did not linger long as a teacher, he wrote that ". . . after all these years, I believe I would have loved teaching better than publishing."

Mr McGraw's introduction to publishing came while he wrote school news and gossip for a weekly paper in his home town. In addition, he wrote for a monthly publication, "The Countryside," at $5 per column, and sold subscriptions to it.

His severance from the teaching profession followed his graduation. A summer vacation (1884) spent selling subscriptions for the industrial publication of a friend brought him $40 weekly beyond expenses. School teaching, at $700 per year, didn't compare with this. He spent one year more in the class room, fulfilling a commitment. Then he forsook formal education for industrial journalism. Half a century later, he relinquished direction of the world's largest industrial publishing group.

His Chautauqua friends who preceeded him to New York had founded the *American Journal of Railway Appliances*, and had purchased another, *Steam*, which they re-christened *Power*. At the time of Mr McGraw's first experience in the field, they started a third paper, *Street Railway Journal*. Mr. McGraw's formal publishing career started with selling subscriptions and advertising for these three.

He found the future in such a career "promising," but its present a struggle. Within a year, the company was without funds, but not without debt. It owed him $1,500 and had a paper bill of about $900 more. Called in for a conference, Mr McGraw was asked whether he could raise any money.

In Mr McGraw's own words, it was the confidence of youth which answered "Yes." Then came the problem of raising it. His answer came as he strolled up Broadway and passed the office of the New York Life Insurance Co. He took out a $2,000 policy on his life, payable to James Knapp, a wealthy Quaker farmer of Chautauqua County. With the policy and a note, he called on Knapp and got a check for $1,000.

"Jamie," said the friend of his childhood, "thee can have the money, but keep the life insurance policy. If thee lives, thee will repay; if thee dies, the money matters not."

The new capital and the debt owing to him were recompensed in stock. At 26, James H. McGraw was vice-president of the publishing house. In two years, the firm paid a 10 percent dividend—and had fallen into disagreement as to its future. The dispute centered around *Street Railway Journal*. As he put it:

"In those days, the paper was devoted to the interests of the horse, its care and its car. I had become acquainted with the group of men who were fast making the electric street railway an actuality. I became convinced of the impending doom of the horse car and of the cable car, and insisted that the *Street Railway Journal* must have an editor who knew something about electricity. The importance of the real editor was becoming apparent even in those days. But many people maintained that the horse would be able to resist the invasion of electricity, and that the railway companies could not afford to lose the revenue derived from the principal byproduct of the horse."

The firm broke up. Mr McGraw took the *Street Railway Journal* and forthwith hired an electrical editor. "Developments in that industry," he said later, "rapidly proved this viewpoint."

What Mr McGraw described as "a fundamental principle of business and technical journalism that I believe can not be too seriously stressed" grew out of this experience. He added that:

"It is the fact that industry is always ready for leadership. The editor's responsibility, in other words, is not merely to reflect current news and opinion, but to provide a vehicle for advancing thought."

This was a far cry from the "paste pot and shears" era through which industrial journalism was then passing. But Mr McGraw advanced this thesis and made it stick. This and other principles were the cornerstones of the career—and the com-

of the Electrical Industry

pany—he built. He and a contemporary, the late John A. Hill, introduced sound circulation figures by being the first publishers to print in their magazines the total circulations of these publications. This ended the ancient practice of claiming what circulations the traffic would bear.

He demanded truth in advertising, and insisted throughout that "the modern business paper has taken upon itself the role of a marketing counsellor as well . . ." Its business staff, he wrote, must study products, determine markets, develop advertising appeals and suggest copy and customer sales programs for the advertiser.

Editorially, Mr McGraw fought the ivory tower editor. It was his demand that editors maintain constant contact with the fields they covered. The good editor, he said, wore out the soles of his shoes rather than the seat of his pants. Editing, he went on, must include active participation in the affairs of the industry about which one wrote.

"When the first plans for forming the American Institute of Electrical Engineers were being discussed," Mr McGraw wrote, "W. D. Weaver (then editor of *American Electrician*, a McGraw paper) had a large part in them and some of the early meetings of the group were held in his office. That interest in technical societies is typical of the technical editor. Twenty years earlier, the preliminary meeting of the founders of the American Society of Mechanical Engineers was held in the offices of *American Machinist* (a McGraw-Hill publication.) Much of the same sort of a story could be told of the starting of the American Institute of Chemical Engineers in the office of the progenitor of *Chemical and Metallurgical Engineering* (now *Chemical Engineering.*)

"The purpose of the modern business publication," Mr McGraw wrote, "may be described thus:

"1. To collect and disseminate experience of those engaged in a certain industry, profession or trade.

"2. To act as interpreter of events and developments.

"3. To serve as a leader of sound thought and policy.

"All of these functions are important, but that which distinguishes a great paper from an ordinary one is the extent of the leadership it exercises. And this leadership, to be in balance, must in turn provide three distinct services:

"1. It must satisfy the needs of the reader and promote his progress.

"2. It must establish a circulation that will present to the suppliers of service and equipment to that industry or profession a selected audience that represents the responsibility and buying power of that field.

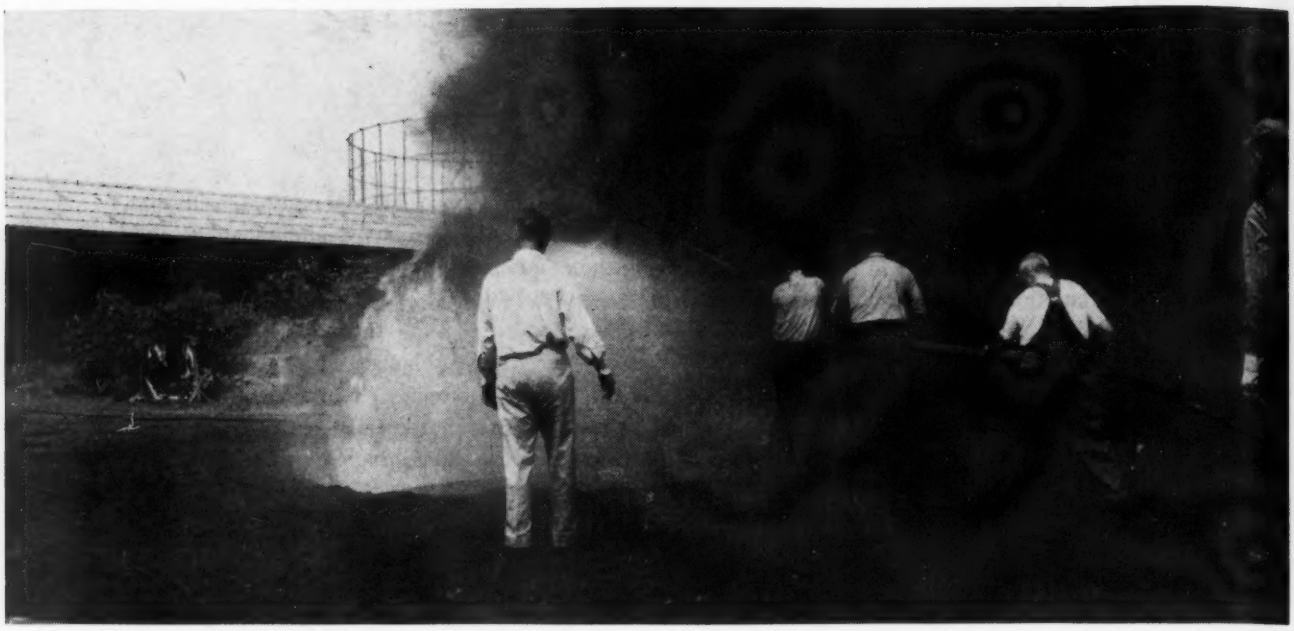
"3. It must provide for the advertisers to that industry a practiced guidance that will assist them to the successful development of their markets and to the profitable presentation of their products."

The McGraw-Hill Publishing Company, which he built on these principles, was organized in 1915. It followed shortly after the death of John A. Hill, who had "left an engine throttle in the far West to come East and work on a locomotive paper." The McGraw Publishing Company acquired his publications and, under its new name, opened its existence with nine publications. Seven years earlier, the book divisions of each company had been consolidated into the McGraw-Hill Book Company. A trade division—Whittlesey House—was established in 1930. Publication of fiction began in 1944.

Throughout his career, James H. McGraw played an active part in the development of the electrical industry. ELECTRICAL WORLD was one of his first papers. *Electrical Merchandising* followed shortly thereafter, and further subdivision of the publishing sphere of the electric industry was to come with *Electrical Construction and Maintenance*, *Electrical Wholesaling* and *Electrical West*, all McGraw-Hill publications.

In 1925, he established the James H. McGraw Award for Electrical Men. It is an endowed award, established "to encourage constructive thinking for the advancement of the electrical industry." Under it, four medals and a purse are given in recognition of the most important personal contributions to electrical progress in the manufacturing, wholesaling and contracting branches, and for cooperation in promoting the general welfare of the industry. Mr McGraw was a member of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the Illuminating Engineering Society, and the National Electric Light Association, as well as many other societies and clubs not associated with the electrical industry.

In 1929, Mr McGraw was awarded the degree Doctor of Commercial Science by New York University. In 1944, he was honored by the Fredonia State Teachers College Alumni Association. In 1927, he was awarded the Bok Gold Medal, presented as the Harvard Advertising Award, "for distinguished personal service to American commerce and industry through raising the standards of advertising."



STUDENTS GET PRACTICE in extinguishing oil fires with the latest and most effective types of fire-fighting apparatus. Low-velocity fog nozzle, shown here with gooseneck applicator, is used to smother the fire when blaze originates in confined location

Fire-Fighting Instruction Includes

W. E. ROSSNAGEL
Safety Engineer
Consolidated Edison Co of N. Y.

New York utility runs training school for men on basis that best in equipment is not enough for emergencies. Men get first-hand experience in extinguishing practice oil fires

FOR MANY YEARS past we have given "key" men in generating stations and gas plants, and many other employees, general instruction in fire-fighting techniques. Lectures held at various locations, explain standard fire extinguishers. Sectional models are shown and use of the several types is demonstrated on very small practice fires indoors.

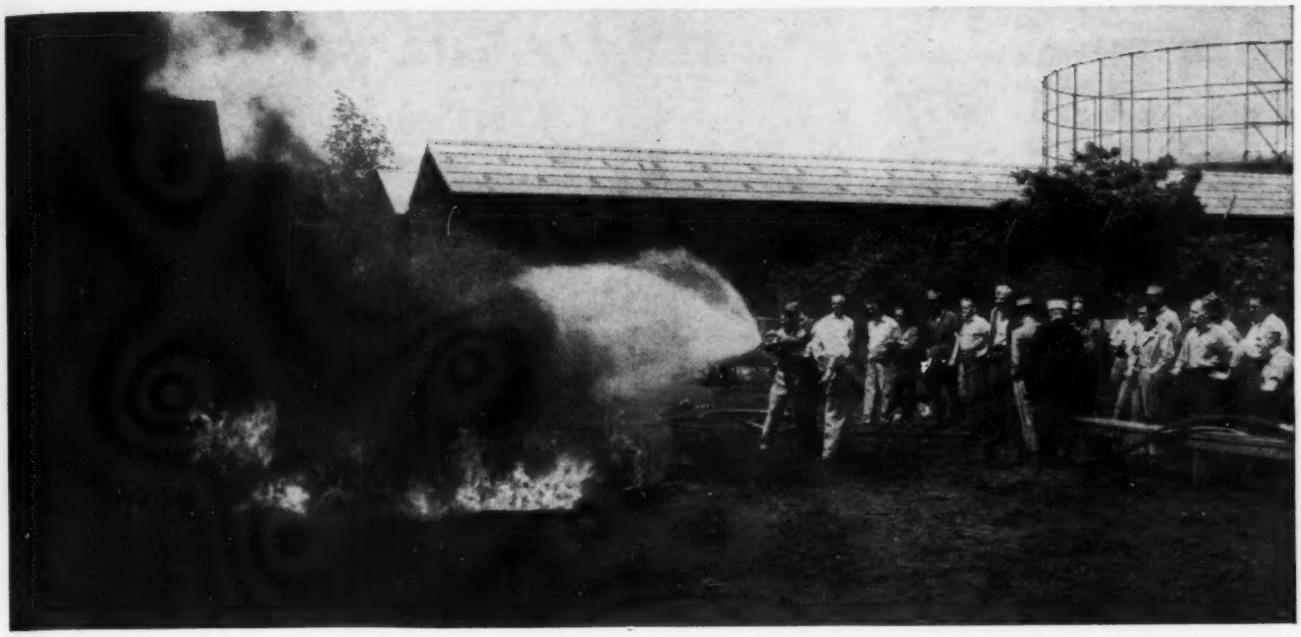
However, with installation of the latest and most effective apparatus, such as water-fog equipment, instruction is not so simple. These high-velocity fog nozzles and low-velocity applicators require a more elaborate training program.

To provide this, a vacant lot adjacent to one of the large gas plants, and far removed from residential areas, is utilized. A fire hydrant with normal water pressure about 95 psi is on this lot.

The instruction begins with a short discussion of the three classe of fires. Class A fires in ordinary combustible solid materials are best extinguished by cooling. There is no better agent for this than water, and lots of it. Class B fires in flammable liquids can be put out by cooling or smothering. Class C fires in electrical apparatus are fundamentally similar to either Class A or Class B. But the extinguishing agent must be a non-conductor of electricity; carbon dioxide, dry powder or water fog.

Students are warned against the use of high-velocity fog in confined

EMBRYONIC FIRE FIGHTERS pay close attention as intricacies of standard extinguishers are explained during lecture preceding actual demonstration. Subsequent practice fires provide opportunity for demonstrating this new-found knowledge



APPROACHING OIL FIRE from windward side, three students operate a high-velocity fog nozzle. Outdoor classroom provides unlimited space for practice in stretching and coupling hose lines and actual extinguishing problems

Close Contact With Heat And Smoke

areas where aspirated air can cause the flames to be driven up the far wall, across the ceiling, and out the doorway through which the fire party is entering.

In confined areas, the low-velocity fog is preferable as no air is aspirated. The long gooseneck applicator tube makes it possible to approach the fire while protected by a wall adjacent to the doorway.

At this point, the students are ready for actual practice. Stretching and coupling fire hose lines is considered first. Three men are selected to run with a hose cart; 2 men pulling and one man following. As they approach the hydrant, the latter man pulls off the female end of the hose, and making a large loop, couples it to one of the hydrant butts. The two men pulling the cart unwind all the hose. Three other men, each carrying a "doughnut" roll of hose come running. One man drops his hose at the hydrant; the next about 50 ft away; and the third about 100 from the hydrant. Other men stretch out the hose and the lengths are coupled together.

The hydrant is opened and the students given an opportunity to handle the hose under pressure. They operate the fog nozzle in the necessary circular motion and then get the feel of the kickback from the "solid" stream. With this preliminary experience under their belts, the men are ready for actual smoke and flames.

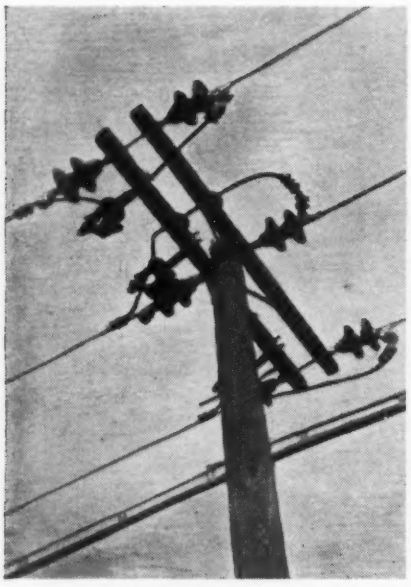
The fire pit, 15 ft in diameter and 6 in. deep, is situated in the center of the open lot. This pit is lined with by-product tar and filled to a depth of several inches with water. Fuel oil or discarded transil oil is poured on this. A small amount of gasoline is poured on the oil for priming purposes and then ignited. When the entire oil pool is ablaze, two men approach from the windward side with the high-velocity fog nozzle. The instructor accompanies them. The nozzle is slowly moved in a circular motion to present a wide and high curtain of fog. This fog curtain, in addition to extinguishing the flames, protects the men from the intense heat. The time required by the novices to extinguish the fire usually ranges from 5 to 10 sec. Similar fires are extinguished by men working in pairs until all have been given practice.

Next on the program is the low-velocity fog applicator. This is attached to the high-velocity nozzle. Four men are required to handle this combination because of the additional weight of the 12-ft gooseneck applicator. With the practice fire again ignited, the fire party approaches from the windward side. The applicator is moved in an up-and-down motion with only enough side motion to give necessary coverage. When using the low velocity gooseneck nozzle, the students must approach much closer to the flames. But the low-velocity fog does not agitate the fire as much as does the high-velocity type.

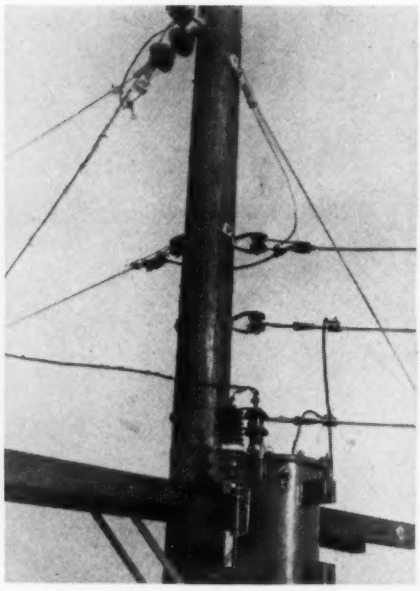
The hose lines are now moved so as to approach the fire pit from the lee side. This presents a greater potential danger should a nozzle clog or a hose burst. To offset this, an emergency hose line is charged and manned as a standby.

At the completion of this instruction, the hoses are uncoupled, drained and recoiled. Proper method of rolling up hose is taught to avoid kinks and twists.

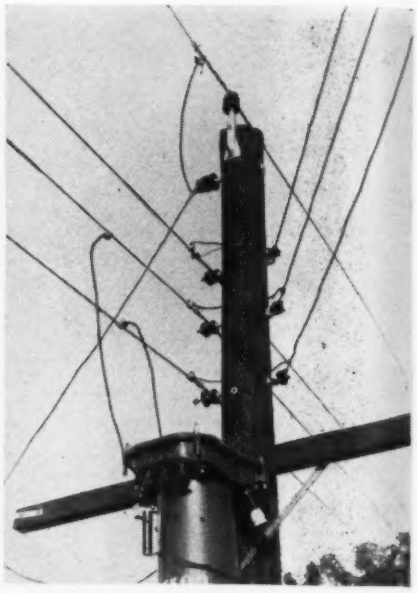
Present plans for the expansion of this fire school include the addition of discarded oil-cooled transformers; open and closed tanks; and appartus to produce running oil fires. This equipment will provide a more realistic touch, in that it will simulate actual conditions met in the plants.



12-KV FUSE POLE has No. 3 all-aluminum line conductors dead-ended on "dog-leg" clamps. This installation also has No. 1/0 weatherproof copper jumpers connected in bimetallic parellel-groove clamps



TRANSFORMER INSTALLATION for all-electric turkey farm. 7,200 volt primary and line neutral are No. 2 all-aluminum. No. 3/0 all aluminum secondaries and neutral dead-ended on No. 3/0 copper automatic dead ends



SEMI-RURAL LINE at 7,200 volts has 200 ft spans. No. 2 all aluminum primary has armor rod protection. Neutral and secondaries of same size protected with ribbon. Nicopress splicing sleeves in neutral and secondaries

Tennessee Utility Adopts Aluminum

CHARLES E. BRYAN
Chief Engineer
Electric Department
Jackson, Tenn.

Relative changes in price and availability of conductor materials following the war forced a shift from copper to aluminum for distribution and service construction. Favorable experience to date has made the choice permanent. Practice and technique involved is described

UNTIL EARLY LAST YEAR copper was used exclusively on the distribution system of the Jackson, Tennessee Electric Department. At that time, the effect of the war and its aftermath on the cost and availability of copper and aluminum forced the selection of an economic alternate conductor material.

Almost over-night we made a complete switch to all-aluminum cable for distribution circuits and to Neoprene-covered solid-aluminum wire for services. This change, of necessity, has affected our distribution construction practices. The scope and nature of these changes are detailed in the following article.

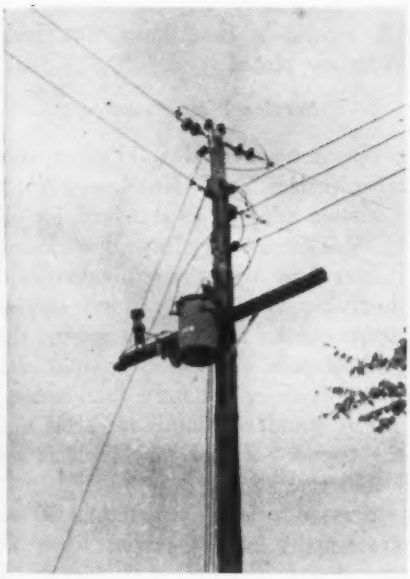
Experience to date with all-aluminum conductors for distribution service has been so satisfactory that in the future it will be used exclusively for all new overhead facilities, for double-circuiting single-circuit routes and for the complete rebuilding of inadequate lines. ACSR cable will be used for rural lines. Copper will continue to be used for transformer primary and secondary leads, pole grounds and for matching existing facilities, such as "three-phasing" single-phase lines.

Results with solid Neoprene-covered aluminum service wire have been equally satisfactory. A few services were "sleet tested" during the winter of 1946. A large number were subjected to some fairly bad storms this past summer. More than 4,000 aluminum service wires have been installed to date. The only failure was caused by a falling tree limb. In this instance, the aluminum wire broke but the Neoprene jacket held and did not allow the wire to fall to the ground. The sudden change in sag made the break obvious enough so that it was immediately found by the trouble shooter.

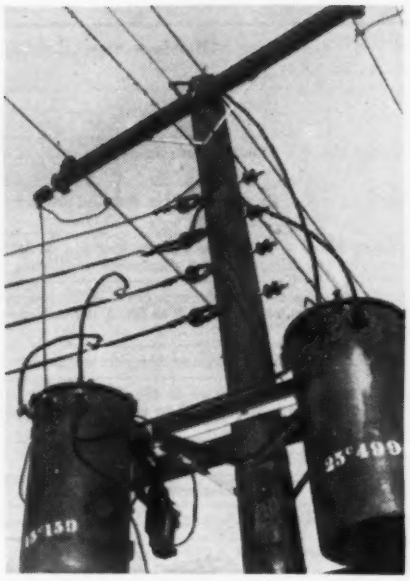
Distribution Conductors

Prior to last year, hand-drawn copper was used exclusively for both rural and urban construction. The standard copper conductor sizes then used for various types of construction are summarized in Table I.

Rural customer density was high enough to warrant 300 ft spans rather than the 400 to 500 ft spans possible with ACSR or Copperweld conductors. Moreover, the telephone company was reluctant, at that time, to "go joint" on lines with spans greater than 300 ft. This was of considerable



7,200 VOLT DEAD-END has bare hard-drawn copper on right; No. 2 all-aluminum on left. No in-line guying was necessary in this installation as tension in aluminum wires is about equal to that in hard-drawn copper



THREE-PHASE SERVICE supplied 4-wire delta has No. 2 Neoprene-covered neutral. Two No. 2 Neoprene-covered aluminum wires are twisted together for each of two "hot legs" and "power leg". No. 1/0 weatherproof copper leads used

For Distribution Circuits

importance since upwards of 75 percent of the department's plant was joint with the telephone company and joint use is contemplated on most rural lines to be built in the future.

When the decision was made to switch to aluminum, sufficient No. 4 ACSR was available for necessary rural line construction. The telephone company tentatively revised its standards to permit joint use on spans up to 450 ft and customer density on these lines was enough lower to make 400 to 450 ft spans more economical.

Two Sizes Used

For short and medium-span construction, bare aluminum stranded cable was selected because its price at the time was about half that of copper of the same conductivity and immediate delivery was possible. Two standard sizes, No. 2 and No. 3/0 were chosen to cover the range of distribution system given in Table I. The No. 2 is a compromise between No. 4 and No. 1 aluminum which have the same conductivity as No. 6 and No. 3 copper conductors respectively. The No. 3/0 has a conductivity equivalent to standard No. 1/0 copper conductor and has about half its weight.

Two separate lines of No. 3/0 aluminum on existing class 5 or 6 poles would be cheaper than a single line of No. 4/0 copper on class 4 poles. However, when a completely new circuit is to be built, a single line would be cheaper, but two routes are more flexible.

With No. 2, all-aluminum conductor spans are limited to 300 ft. Armor rodding or ribbon is installed at supports on 200 to 300-ft spans. So far no No. 3/0 aluminum lines are contemplated with spans greater than 200 ft; hence no armor rods will be installed. But armor rods will be required with No. 3/0 aluminum on spans above 200 ft.

Aluminum compression sleeves are used for splicing both No. 2 and No. 3/0 aluminum conductors. The No. 4 ACSR aluminum splicing sleeve is used with No. 2 all-aluminum but the steel core sleeve is wasted. A special aluminum sleeve is furnished for use with the No. 3/0 all-aluminum conductors.

Dead-Ending Practice

Dead-ending of primary conductors in suspension type insulators is done with primary dead end "dog-leg" clamps. No. 2 secondaries and 4-kv primaries are dead-ended with loop dead-end clamps. Ribbon is used in all cases around spools to protect the aluminum from abrasion. No. 3/0 copper flexible automatic dead-ends are used on No. 3/0 aluminum secondaries with generous amounts of "No-Ox-Id" applied on both the cable and fittings.

It is anticipated that manufacturers will shortly introduce a complete line of automatic line splices and automatic dead-ends for all-aluminum conductors. These new fittings will greatly facilitate installation and maintenance.

Standard aluminum parallel-groove clamps are used throughout as indicated in Table II. Cadmium-plated bronze hot-line clamps are now standard for the system and are used on both copper and aluminum. Hot-line clamps are used on all line taps and transformer stringers. The line conductor is ribboned for protection

TABLE I—Standard Wire Sizes Used for Distribution

Use	Former Copper Wire Size	Present All-Aluminum Wire Size
Primary tap lines in residential and comparative lightly-loaded areas; street light pilot; medium-span rural line primary and secondary	No 6 bare hard drawn solid	No 2 bare hard drawn stranded (No 4 ACSR on long span rural lines)
Short 12-kv feeders to industrial customers up to 1,000 kw; secondaries in residential and light commercial areas	No 3 bare hard drawn solid	No 2 bare hard drawn stranded
12-kv feeders to 2,000 kva 12/4-kv sub-stations; 12-kv feeders to industrial customers up to 2,000 kva; major taps from 4-kv network; secondaries in medium commercial areas	No 1/0 bare hard drawn stranded	No 3/0 bare hard drawn stranded
12-kv feeders greater than 2,000 kw	No 4/0 bare hard drawn stranded	2 separate lines of No 3/0 bare hard drawn stranded
4-kv primary network; secondaries in business district	No 4/0 bare hard drawn stranded	No such new lines contemplated at this time

TABLE II—Fittings Used on No. 2 and No. 3/0 Bare All-Aluminum Cable and No. 4 ACSR

Manufacturer and Number	Fitting	Use
Alcoa # 403	Primary dead-end clamp, snubbing type	Dead-ending No. 3/0 all-aluminum primary
Alcoa # 402	Primary dead-end clamp, snubbing type	Dead-ending No 2 all-aluminum and No 4 ACSR primary
Alcoa # 412	Loop dead-end clamp	Dead-ending No 2 all-aluminum primary and No 4 ACSR secondary and 4 kv primary in spool type dead-ends
Alcoa # 196 & Alcoa # 198	Parallel groove clamps	Aluminum tap to No 2 all-aluminum or No 4 ACSR line over armor rods; aluminum tap up to No 2 to No 3/0 all-aluminum line—no armor rods
Alcoa # 194	Parallel groove clamps	Aluminum tap to No 2 all-aluminum line—no armor rods
Alcoa # 197	Parallel groove clamps	Copper tap to No 2 all-aluminum or No 4 ACSR line over armor rods; copper taps up to No 3 to No 3/0 all-aluminum line—no armor rods
Alcoa # 193	Parallel groove clamps	Copper tap to No 2 all-aluminum line—no armor rods
Alcoa # 181	Parallel groove clamps	No 1/0 copper to No 3/0 a l-aluminum—no armor rods
Alcoa # 181	Parallel groove clamps	No 3/0 all-aluminum to No 3/0 all-aluminum—no armor rods
Alcoa # 1103	Armor rod clips	No 2 all-aluminum and No 4 ACSR armor rods
Alcoa ———	Armor rods	10 x 0.125 in. x 45 in. No 2 all-alum num single or double support
Nicopress	No 3/0 all-aluminum splicing sleeve	Splicing No 3/0 all-aluminum
Nicopress	No 4 (7 x 1) ACSR splicing sleeve	Aluminum and steel sleeves both used for splicing No 4 ACSR; aluminum sleeve only used for splicing No 2 all-aluminum
Nicopress	No 4 ACSR repair sleeve	Repairing burned or broken strands of No 2 all-aluminum or No 4 ACSR
Nicopress	No 4 ACSR jumper sleeve	Splicing No 2 all-aluminum or No 4 ACSR jumpers

against burning when taps are connected or disconnected.

No-Ox-Id is applied to all current-carrying fittings as a precaution. It may be found that this is unnecessary as more experience is gained in the future.

To date, experience with all-aluminum conductors has been very good. There are now approximately 25 miles of all-aluminum line in service on this system, covering spans up to 300 ft for No. 2 and up to 150 ft for No. 3/0.

On long spans, No. 2 aluminum requires more time for stringing, sagging, and applying armor rods than the copper it replaces. For shorter spans, however, both sizes of aluminum require about the same time to install as the copper they replace. All-aluminum cable is easier to handle than copper because of its weight, but sagging, dead-ending, and splicing of aluminum, using clamps, takes more time than copper using automatic splices and dead-ends. Automatic aluminum splices and dead-ends are expected to correct this difference in relative times.

Copper Jumpers Used

Copper is used for transformer leads and jumpers to switches and fuses to eliminate the possibility of electrolytic action, because the copper connectors on very few transformers, switches, fuses, and lightning arresters are cadmium plated. Aluminum parallel groove clamps with copper inserts in one groove are used for connecting copper jumpers to aluminum line conductors to eliminate the danger of corrosion at this point. However, as a trial on a number of transformers which were recently hung "REA style" (in contrast to our standard mounting on crossarms as indicated in some of the pictures), the service wires were connected directly to the transformer terminals, with No-Ox-Id applied to all terminals that have not been cadmium plated.

Service Wire Practice

Neoprene-covered solid aluminum wire in sizes No. 6, No. 4, and No. 2 has been adopted as standard for all services except very large ones. Being lighter than copper of equivalent conductivity, considerably longer service drops can be run without guying the pull-off pole. Its lighter weight also makes it easier to handle than copper.

For standard aluminum sizes and the copper services they replace, see Table III.

Service to loads larger than 50 kw are usually run of copper since the supply of weatherproof copper in larger sizes is adequate for some time to come. Larger sizes of Neoprene-covered aluminum wire will be adopted as the present supply of heavy weatherproof copper is gradually used up in providing service to these large loads.

Splicing Methods

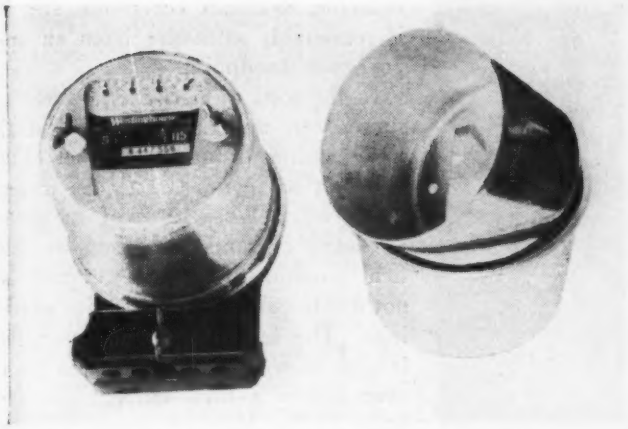
Wire is spliced with Nicopress aluminum compression sleeves. These sleeves make a quick, neat, reliable splice, and are the only splices now available so far as the writer knows.

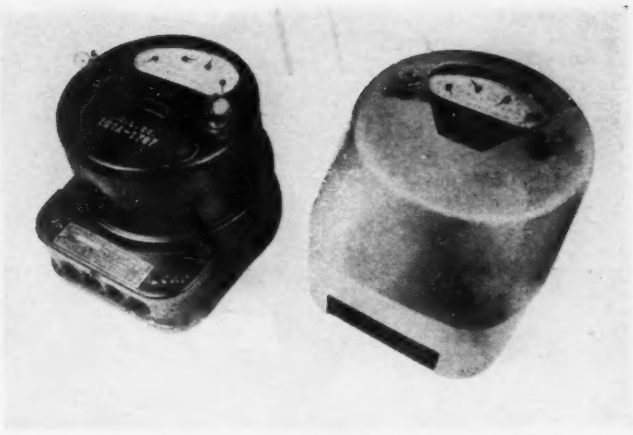
For aluminum services tapped from copper secondary lines, bronze-split-bolt connectors with bimetallic washers are used. Parallel groove clamps are used for taps from all-aluminum or ACSR secondaries.

Normally, service drops are limited to about 150 feet without the addition of a service pole. However, a few services up to 200 feet have been run in cases where unusual conditions in the field permitted plenty of ground clearance.

TABLE III—Standard Service Wire Sizes Used

Class of Customer	Former Weatherproof Cooper Wire Size	Present Weatherproof Al. Wire Size
2 wire services—little possibility of being a range or water heater customer	No 8 Neutral No 6 Hot leg	No 6 Neutral No 4 Hot leg
3 wire services—range and water heater customers or possible range and water heater customers	No 8 Neutral No 6 Hot legs	No 6 Neutral No 4 Hot legs
Electric heating customers up to 15 kw load; small apartment houses	No 6 Neutral No 3 Hot legs	No 4 Neutral No 2 Hot legs
Electric heating customers above 15 kw load; larger apartment houses	No 6 Neutral No 3 Hot legs	No 2 Neutral 2 No 2 twisted together for each hot leg
Commercial customers with 120/240 v. 3-phase, 4-wire delta or 120/208 v. 3-phase, 4-wire wye, service up to 25 kw load	No 6 Neutral No 3 Phase wires	No 4 Neutral No 2 Phase wires
Ditto up to 50 kw.....	No 3 Neutral No 1/0 Phase wires	No 2 Neutral 2 No 2 twisted together per phase





SHIELD DESIGNS have been developed for most of the common meter types. Shield now being used on Westinghouse type OA and OB meters is shown at left. A shield designed for GE type I-14, Sangamo type H and Duncan types M2 and MD are shown at right

Watthour Meter Accuracy Can Be Preserved Despite Surge Currents

E. L. KELLER
Supervisor of Meters
Duquesne Light Co
Pittsburgh, Pa.

Inexpensive aluminum protector cap easily installed in the field shields watthour meter magnets against the effects of lightning surge currents. Device practically eliminates tendency of some older meters to run fast due to lightning

UTILITY OPERATORS and meter manufacturers have been concerned for many years about watthour meters running fast because of the demagnetizing effects of lightning surges on the damping magnets. Tests on the Duquesne Light system indicated that, for no apparent reason, there was a small percentage of meters running more than 2 percent fast. A much larger number ran more than 1 percent fast, even though all were originally calibrated to run slightly slow. It was concluded that most of this speedup was the result of lightning surges, and that steps taken to eliminate this effect might lead to extended test periods and better customer and public relations.

Several meter manufacturers have overcome this difficulty by replacing chrome-steel drag magnets with new, smaller alnico magnets, that are not materially affected by surge currents. Another manufacturer got the same result by applying a heavy copper plating to the chrome steel magnets.

However, replacement of all old magnets in the thousands of meters on the Duquesne Light Company's system was impractical, because of the work involved and the excessive cost of such replacements. Furthermore, many existing meters were so designed that the installation of the new magnets is not possible. Accordingly, the meter division set up a program to solve this important meter problem.

Simple Design Developed

Ten years ago it was demonstrated in our laboratory that the lightning surges do have a weakening effect on damping magnets.

In trying to find a solution to this problem hundreds of tests were made. Finally the present simple yet effective method of protection was developed. Cost of the resulting protective device is less than fifty cents per meter. It can be easily and quickly installed in the field. The device is simply a cylindrical aluminum shield that slips in place *under* the glass meter cover. It will eliminate the tendency of meters to run fast due to lightning. As a result, it may provide a basis for materially extending periodic testing periods.

When a surge resulting from a lightning stroke occurs on the line to which the meter is connected, the magnetic field set up by the surge current induces currents in the aluminum protector shield that create an opposing field which neutralizes that part of the surge field affecting the meter. Thus the damping magnets of the meter are unaffected. The efficacy of the protector is clearly shown by the results of tests in which meters were subjected to artificial surge currents on the order of those caused by lightning strokes. The results (Fig 1) indicate a reduction in error, at 10,000 amp, from about 16 percent to 1/10 of 1 percent.

Aluminum Company of America has recently signed a contract with the author for the manufacturing and distribution of the meter shields described in this article.

ALUMINUM SHIELD installed under glass cover of outdoor meters eliminates tendency of meters to run fast due to lightning surges. Currents induced in shield create opposing field to neutralize affect of surge on meter

In addition to surge protection, the aluminum shield provides highly-desirable protection against external heat. Tests indicate that meters so protected run 40 degrees cooler in sunshine than meters without such protection. This is an important feature, particularly for meters installed in southern states.

Advantages of Shield Protection

The shield can be adapted to fit any of the common types of meters and can be installed without trouble. Recalibration of the meter is not necessary. It will not deteriorate in service and therefore will last indefinitely. It provides better general protection than special drag magnets.

The Duquesne Light Company has already purchased 30,000 of these surge protective shields, and will equip all of its single-phase meters with them as soon as possible, in order that all of its customers will have the benefit of lightning-surge-protected watthour meters.

The shield fits any make socket-type meter that uses a standard glass cover. Other designs have been made for some of the various terminal-type meters. Accompanying pictures show the shields now being used on Westinghouse type OA and OB meters and also a shield designed for the G-E type I-14, Sangamo type H, and Duncan types M2 and MD. The latter shield has been given exhaustive tests on these meters. It gives excellent protection, although none has been manufactured as yet. It fits *outside* the glass cover instead of inside as do the other shields. It is held in place by the same studs and wing nuts that hold the meter cover.

Present shields being installed by the Duquesne Light Company are made of 18 gage aluminum, pressed to the required shape, with a hole punched in the front. Other metals were tried. Aluminum was chosen because its cost is low, it is most easily shaped, its overall surge protection is very good, it is a good heat reflector, it resists corrosion, and it is reasonably attractive from an appearance standpoint.

In the tests on socket-type meters, surges were applied to a bare-neutral wire passing through the socket (Fig 2a), but not connected to the meter electrically. Weakening of magnets by surge currents is caused by the field around the conductor and is not due to currents in the series windings. The inductance of these coils is high enough to cause them to flash over before a high current can be built up in them. A surge usually enters on all service wires simultaneously, but the easiest path of this surge to ground is along the neutral wire.

Nature of Test Wave

An oscillatory wave of about 25 kc was obtained from a surge generator. Earlier tests had shown such an oscillatory wave to be over four times as harmful as a highly damped wave of equal magnitude. The circuit resistance was kept low in order that the oscillations would not be damped out too rapidly. The wave shape, frequency, and decrement, as taken from an oscillogram, are shown in Fig 2, in which the negative portions of the wave have been omitted.

Meters have been tested over a very wide range of currents up to 50,000 amp. This current is far in excess of any to be expected in the field except in an extremely rare case. Seventy percent of all strokes are under 2,000 amp and only one percent are over 15,000 amp. Much of the experimental work was done at high current in order that the changes in registration would be great and that the protection could be made as good as economically possible.

Test Procedure—Terminal Types

Terminal type meters have been tested with the surge-carrying conductor in various positions (Fig 2). In any of these arrangements, an unprotected meter will run considerably faster after a surge current has passed through the wire. Most of the development tests were made with the arrangement of Fig 2, using two wire meters, because this most nearly approximated an actual installation and was also difficult to protect from surges.

After developing shields for the Westinghouse OA and OB terminal type meters, it was hoped that adequate protection could be provided for other makes of the terminal type merely by making similar shields of the correct size and shape to fit inside the covers of the meters. Tests soon showed that the solution was not that simple. Meter cases are made of magnetic materials, and some increase and distort the field produced by the surge current so that the simplest shields are not the most effective.

How It Works

The shield must be shaped so that the currents induced in it can produce an opposing field strong enough to neutralize that part of the surge field affecting the meter. To do this satisfactorily, the shield should form a conducting loop around the magnets.

For the *n*th degree of protection, it is necessary to almost close the front of the meter, in addition to forming a loop as described above. This provides additional eddy current paths to neutralize stray and distorted flux lines which do not cut the loop but which can reach the magnet. The efficacy of such a closed shield that performs both of these functions was demonstrated by test. The change in registration of a test meter was found to be only 2/10 of 1 percent on a 50,000-amp surge. A similar unprotected meter will speed up 50 percent, and one equipped with copper-clad or alnico magnets, 3 to 7 percent. A compromise must be made by leaving a hole in the front to read the dials and observe the disc.

Effect of Surge on Meter

It is beyond the scope of this article to explain how lightning strokes cause a meter to run fast. But it has been observed that strong magnets are weakened relatively more than weak ones and that probably all similar magnets arrive at the same strength after repeated surges. Both of these results might be expected after an inspection of a hysteresis curve including minor loops produced by a demagnetizing force. When a number of surges of equal value were applied to a meter, each one had a smaller effect on the meter accuracy than the preceding one. After sixteen such surges, additional ones caused very little change. The total increase in meter registration was roughly 2½ times the increase caused by the first surge. This was found to be nearly true for all types of meters and for all values of current used, and is no doubt due to self-shielding of the magnet by the steel itself. The first surge will demagnetize the outermost layer of steel, but at the same time will set up eddy currents which prevent the surge current flux from penetrating deep into the magnet. After the surge has passed, the inner section remagnetizes the outer layer. It is then possible for another surge to repeat the process. But the entire magnet has been weakened so that there is less demagnetization by the second and following surges.

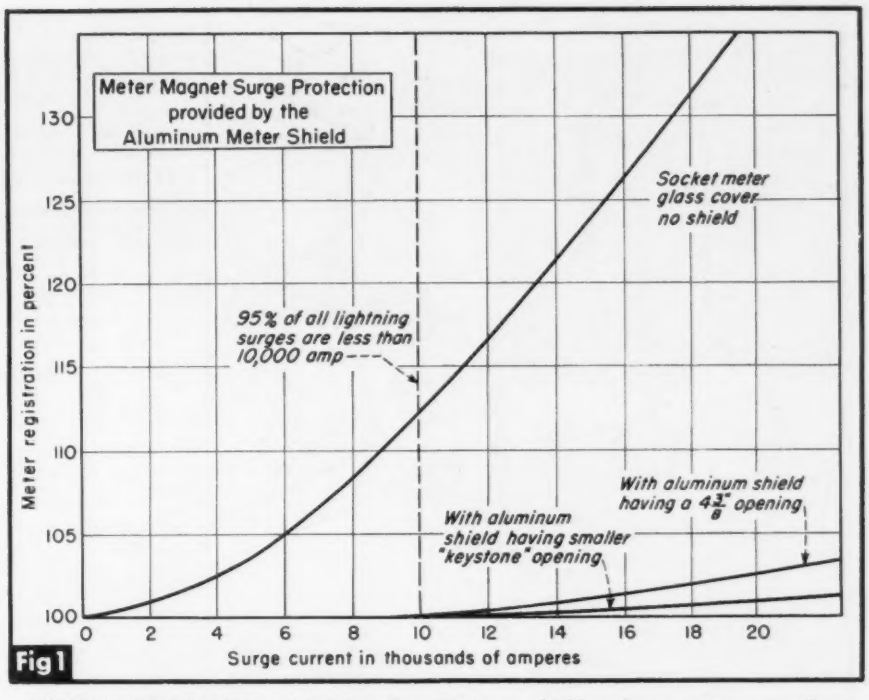


Fig 1

SURGE PROTECTION provided by the aluminum shield reduces meter error from about 16 percent to 1/10 of 1 percent at 10,000 amp surge currents

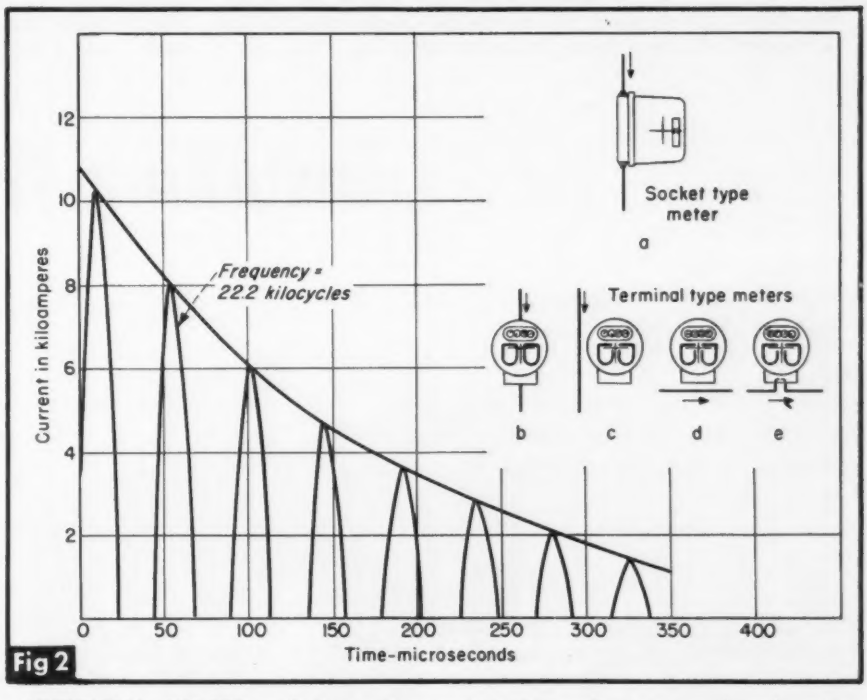
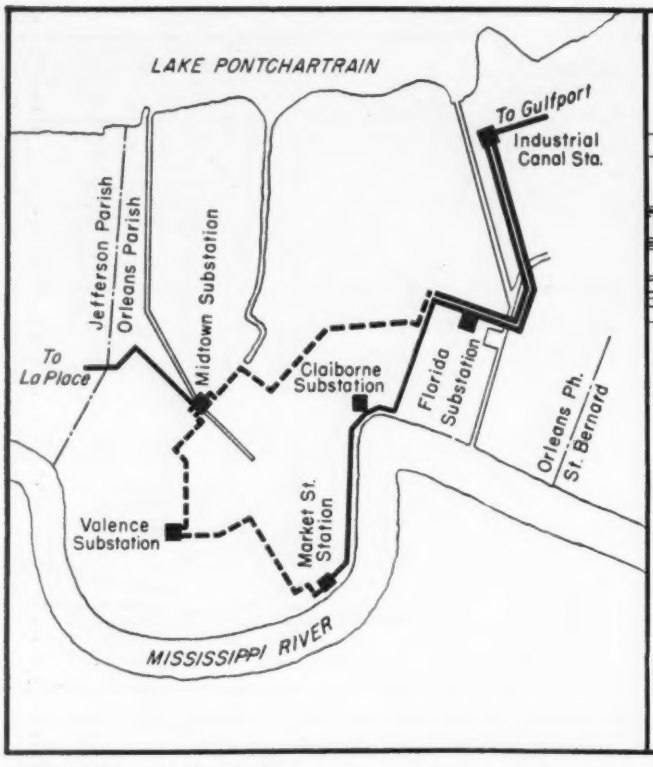
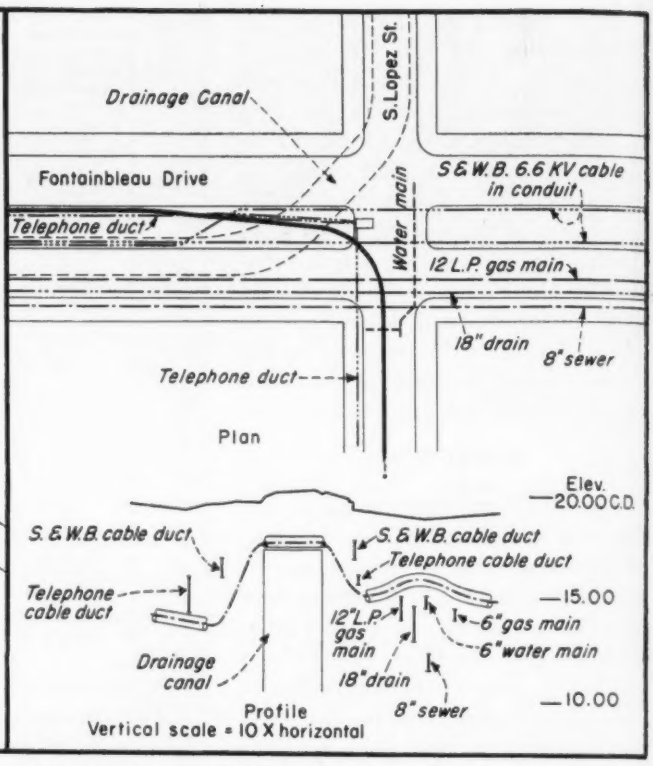


Fig 2

ARTIFICIAL SURGES applied to a bare neutral wire passing near or through meter socket or housing result in 22-kilocycle test wave shown

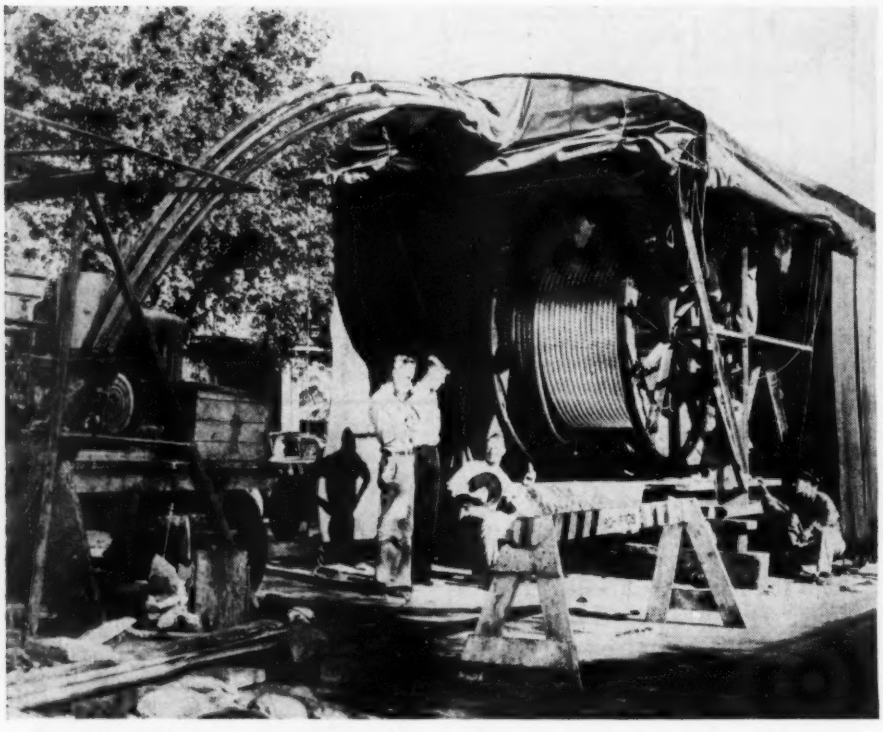


ROUTE OF 110 KV CABLE is shown dotted on a diagram of New Orleans' system. Cable runs from Market St generating station to Midtown Substation, thence to existing tower line

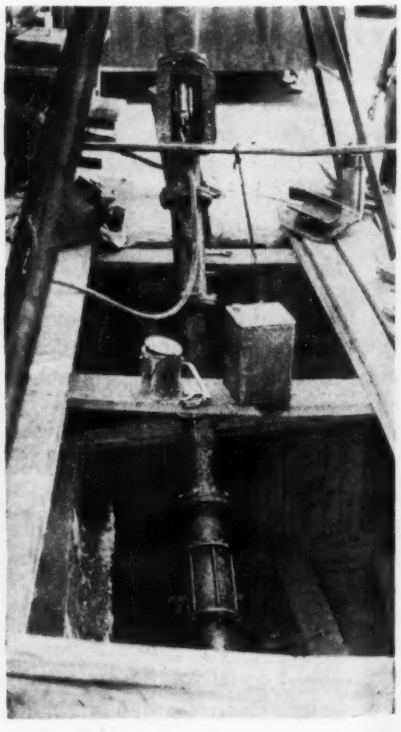


CONGESTED INTERSECTIONS like this made construction difficult. Heavy line is the 110 kv cable. Horizontal bend is 35-ft radius. Double bend within the horizontal bend has 33-ft radius

Installing 110-Kv Oil-Pipe



DURING PULLING operations, curtains were lowered to protect against sudden rains. Telephones connect feed-in point, pull-out point and winch operator. Vacuum pump on trailer at left treats cable sections after pulling



FEED-IN TUBE has opening at top for connecting pulling harness. It was later covered with Plexiglas to observe motion

CROSSING STREETS was a problem. The usual manner of doing this is illustrated. One traffic lane was left open. Laborious hand tunneling gets the pipe under this lane

CABLE FEED-IN RIG showing rack at left for mounting cable reels. Cable feeds into overhead troughs, thence down three small tubes into 6 in. feed-in tube

Cable In Old New Orleans

M. J. CADE
Assistant Electrical Engineer
New Orleans Public Service Inc
New Orleans, La.

Extensive sub-surface obstructions made this 11-mile run of 110-kv cable in oil-pipe one of the most difficult construction jobs in the country. How difficulties were overcome in the field is here told by picture record*

NEW ORLEANS Public Service Inc now has in operation 11 miles of 110-kv cable in oil-pipe. The story of its installation is here told largely in pictures.

Route of the cable was about 80% in city streets; the remainder in parkway and sidewalk. Installation of the 6⅝ in. steel tubing or pipe enclosing the cable followed standard practice.

Selection of the route for the line was made on the basis of existing utility records of underground structures. Before construction began, a survey was made of the route and all intersecting structures were spotted on a plan and elevation by probing, excavating and inspecting manholes.

Because of extensive sub-surface drainage systems in New Orleans, streets are very crowded below grade. It was necessary to cross 15 underground drainage canals, sometimes over them, sometimes through them, and once underneath.

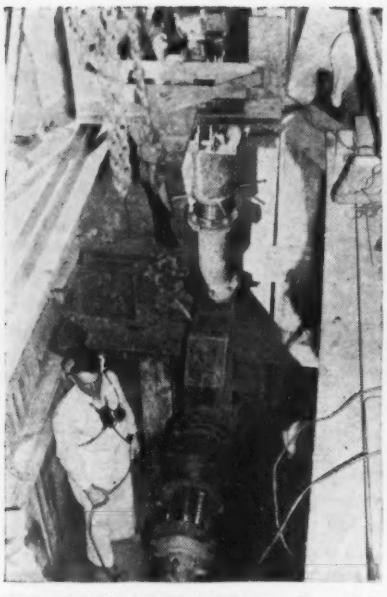
High cost of deep excavations in New Orleans often made it more economical to move conflicting structures than go under them. In all, it was necessary to raise or lower 21 water mains, 2 sewers, 1 drain and 14 gas mains. Some 2,200 ft of gas main had to be moved laterally. Casing installations were required in all of the 13 railroad crossings, some as long as 157 ft.

All this maneuvering resulted in a large number of curves in pipe. Pipe bends 200 ft or less in radius were made cold at a fabricating shop. Fifty-five of these involved some 2,500 ft of pipe.

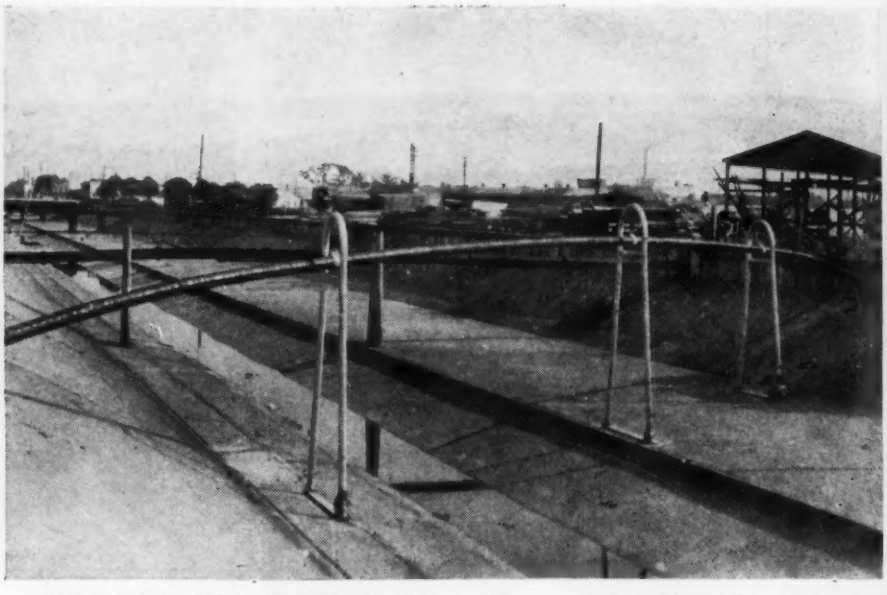
In preparing the pipe for installation, each of the double random lengths were provided with a 4-in. collar which was welded to one end of the pipe at the storage yard. After stringing, the pipe was welded into 300 ft average lengths before it was dropped into the trench. Sections were tested at 500 psi above ground.

Outside of the pipe was coated with enamel and two layers of coal-tar impregnated asbestos felt. Inside of the pipe was given a brush coat of protective paint at the mill. Outside coating was inspected with an elec-

*Based on a paper presented before Engineering and Operation Section, Southeastern Electric Exchange.



CUTOFF WINDOW OPEN after cable pull. Dynamometer on pulley of winch derrick top, gave tension reading



OVER A DRAINAGE CANAL the oil-pipe cable is carried on "hairpin" supports. A semi-circular sunshade was later attached to the pipe. It was necessary to cross 15 underground drainage canals in the construction of this line

tronic detector before lowering into the trench. A final coating check was made after backfilling by applying a tracing current and using two electrodes and a vacuum-tube voltmeter on the ground surface. Faults found in this way were re-excavated and patched.

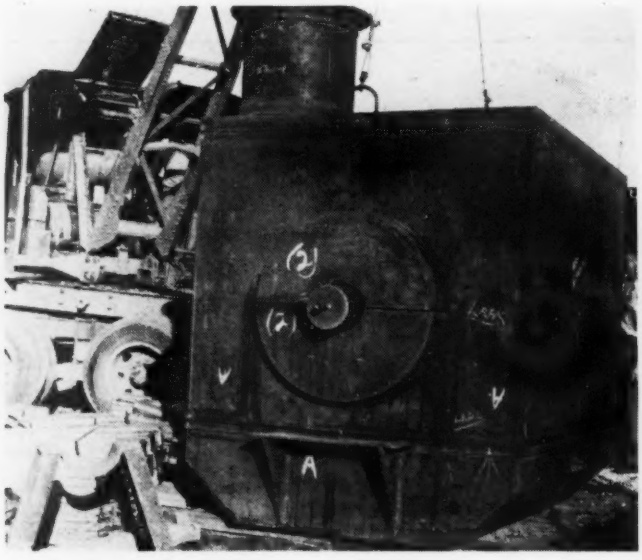
The pipe was laid continuously to, but not through, splice points. Each section was sealed off under 500 psi dry air pressure as completed. This provided a reservoir of air for making pressure tests on the next section to be completed.

Before pulling cable into the pipe, a wood-sheathing-lined excavation 12 ft by 7 ft and of various depths was made at each splice joint. The pipe was cut to the 7 ft opening required for the splice sleeves.

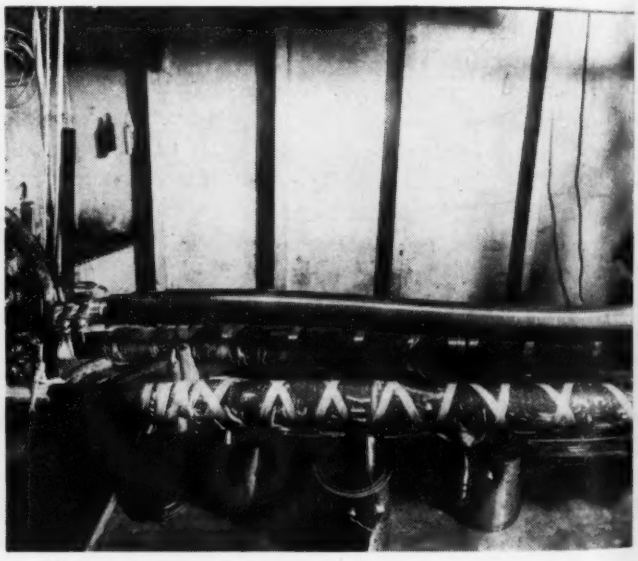
When the cable had been pulled, "nightcaps" were installed and the section sealed off under 5 psi of dry nitrogen. The next day a vacuum treatment was applied to boil out any moisture that might have accumulated in pockets formed by the coupling-type welds. Following this, the vacuum was broken with dry nitrogen and left at 5 psi positive pressure.

The cable conductor is 600,000 cir mil Compack round, covered with 480 mils of paper insulation, mass impregnated. Three metallized paper tapes are next to the conductor, two over the insulation. A moisture seal over the last of these consists of two pairs of 3 mil $\frac{3}{4}$ in. dead soft aluminum tapes intercalated with 7 mil $\frac{3}{4}$ in. polyethylene tape. This seal is covered with another aluminum tape over which are two D-shaped copper-skid wires.

Cable joints consisted of 33



PORTABLE MANHOLES were used for cable splicing. To make them water tight, the four sections were sealed with gaskets and compound. At joint around cable pipe a coupling ring was used



INSIDE PORTABLE MANHOLE a splice is shown nearly completed. Bottom two phases are complete but for splints. Taping on top phase is 90 percent complete

PRESSURE TESTING assembled sections of pipe was done above ground. Compressed air was supplied by two gasoline engine-driven 500 psi, 30 cfm compressors

COMPRESSOR supplying air under pressure for testing pipe welds. At left is carbon dioxide cylinder for making dry ice. Test cell on tool box is for pressure testing bell-hole welds

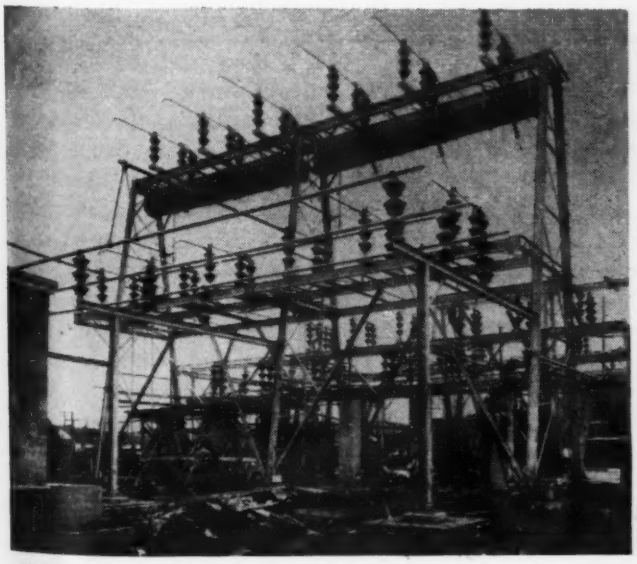
straight line splices with no stop or semi-stop joints. At line splices the steel pipe was expanded to an 8 in. sleeve 7 ft long with its ½-in. wall split longitudinally. After welding, sleeves were hand-wrapped with the same material as the mill coating and the whole assembly backfilled as a line pipe without manholes.

For the splicing operation a portable water-tight manhole was clamped around the pipe that enclosed the cable. Humidity inside the manhole was maintained at about 30 percent by heat exchanging equipment thus permitting the splicers to work without gloves.

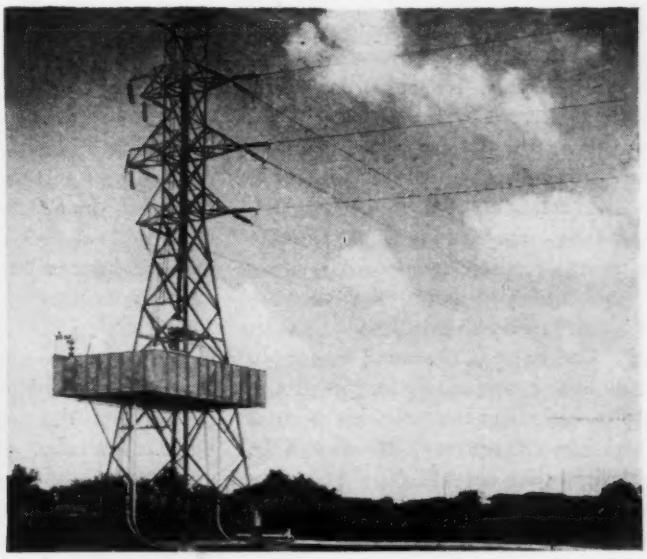
The cable oil for filling the pipe, after the cable installation was completed, is a synthetic designated as HC-8 by the cable manufacturer. It has a viscosity of 800 SSU at 100 F and 30,000 SSU at 30 F. Oil was shipped in tank cars and de-gasified at the filling points. About 60,000 gal were required to fill the system.

The potheads were supplied by the cable manufacturer and are of the single-phase type rated at 138-kv. Stop tubes are of laminated paper-phenol combination. At the pothead base there is a gland-type semi-stop joint. The stop tube is above this semi-stop and is assured a supply of oil under low pressure conditions by connection to a gravity tank which in turn is connected to the line pipe.

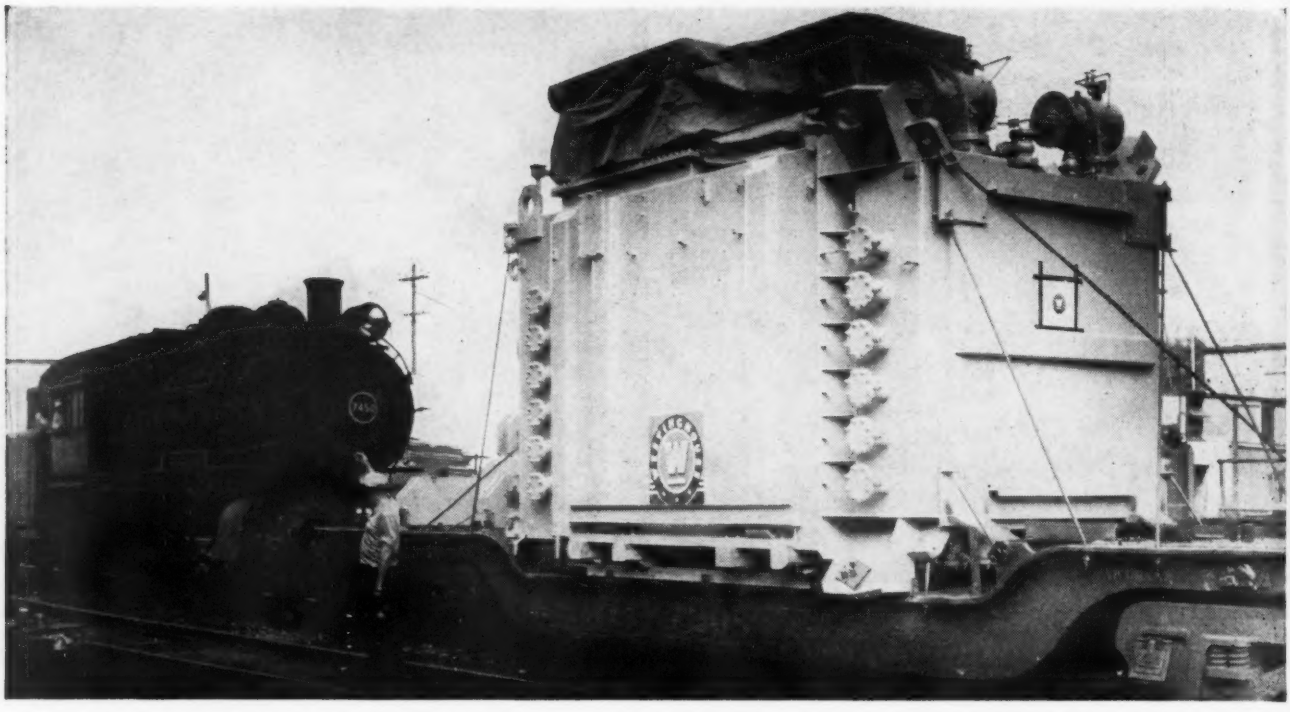
Installation of the entire cable system was under contract to a local general contractor. Splicing was done by a sub-contractor. Technical supervision was by a field engineer of the cable manufacturer. This representative furnished instructions to the cable splicers.



TERMINALS AT MIDTOWN substation. Overhead tanks of 1,300 gal capacity are oil reservoirs for two sections of line. Elevated position required to maintain positive pressure



TOWER TERMINAL where cable circuit connects with 110 kv overhead line. Steel panelling protects potheads from possible rifle fire or other vandalism



ONE OF THREE 230,000-volt, 83,333-kva single-phase power transformers for the Bonneville Power Administration's Snohomish substation near Seattle completely assembled ready for shipment. Each of these transformers is triple-rated

Large Transformers Grow Smaller

FRANK SNYDER
Manager, Transformer Engineering Dept
Westinghouse Electric Corp
Sharon, Pa

Improved insulation structure, better core steel and tank designs that conform to shape of modern shell-form cores make higher transformer ratings possible in units of smaller size. Trend to 3-phase units and higher voltages seen

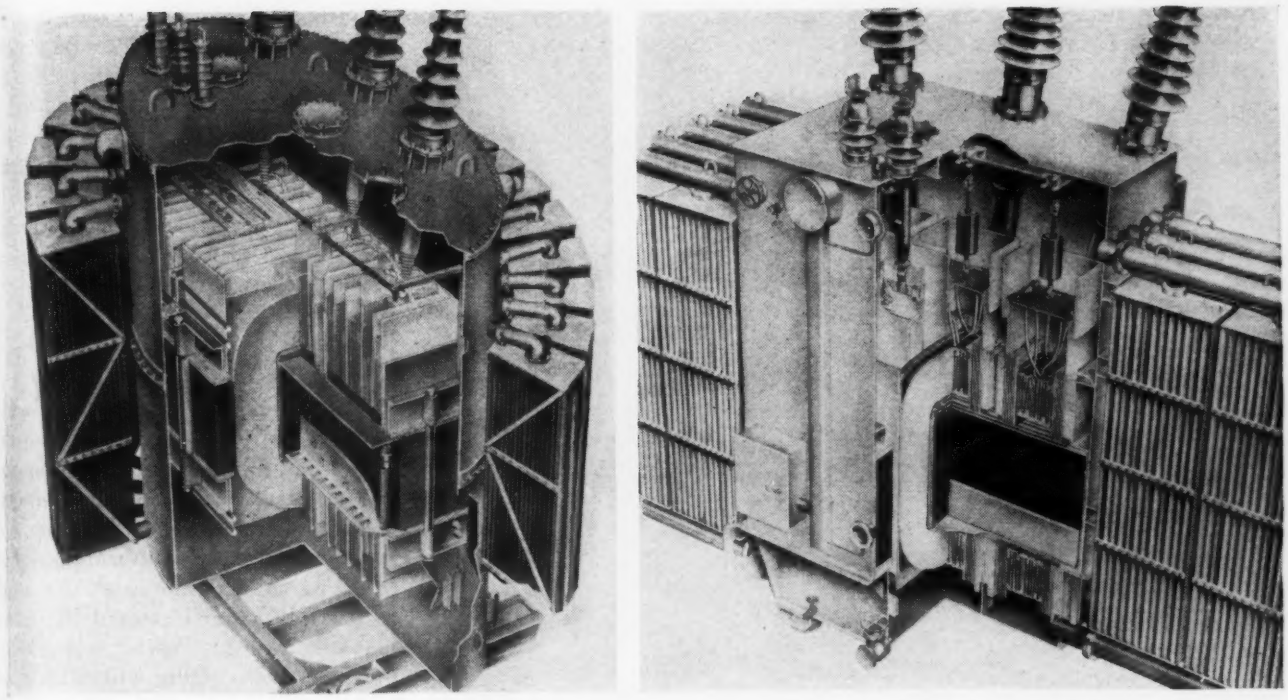
AT THE CEREMONIES last fall when the half-million-volt test lines at the Tidd Station of The Ohio Power Company were first shown publicly by subsidiaries of The American Gas and Electric Company's control system, some observers were amazed and a little disappointed at the relatively small size of the 500,000-v transformers used. In spite of their size these transformers were neither under-insulated nor over-excited when operating at full test voltage. The bank is designed to supply 5000 kva continuously at 500,000-v and to withstand not only this normal operating voltage but also switching and lightning surges. The facts are that high-voltage power transformers have been completely revolutionized in recent years so that for comparable kva and voltage ratings they are no longer the structural giants they were.

Three major developments are responsible for these changes in design and fabrication of the modern high-voltage power transformer. The first stemmed from the discovery that lightning voltages could be tamed or at least shunted harmlessly to ground without damage to the transformer. The first step in this development was to determine the magnitude and duration of the voltage and current impressed on the transformer by the lightning stroke. With this problem understood, the engineer soon found that he could not only provide much greater surge strength but do it with greatly reduced insulation structure. The basic principle involved in this development was the discovery that lightning surges are very good at *creeping over* barriers but are relatively poor at *puncturing* them.

Whereas both normal operating and surge voltages were originally restrained by extending pressboard barriers to provide ample creepage surface, the windings of the modern high-voltage power transformer are completely enclosed with barriers. The only way in which a surge voltage can now get out of control is to puncture a barrier.

Interleaved Box Type Insulation

Once the problem was understood, it became clear that the windings could be designed so as to distribute the surge voltage more or less uni-



IMPROVED INSULATION STRUCTURE reduces transformer weight and size. View at left shows extended barrier insulation structure of older shell-form units. At right is interleaved box insulation used in modern power transformers

With Improvements In Design

formly instead of permitting it to pile up on the ends. This let the designer put the major insulation in equipotential planes. Thus the insulation was fully coordinated with the voltage stresses to be withstood resulting in increased surge strength and more economical use of materials. The resulting overall structure is termed the interleaved box-type construction, while the older and superseded type is referred to as the extended barrier form. The old and new insulation structures are shown above. This change has resulted in a substantial reduction in overall weight and dimensions.

The second major development leading to the reduction in transformer size and weight was initiated by the realization that the core required for an efficient magnetic linkage between windings represents a considerable proportion of the weight and space in a high-voltage transformer. Until about 1937, high-silicon, hot-rolled steel was the best material available for the cores. The designer had to put enough of this material into the transformer to keep the losses, exciting current, and temperature down to values acceptable to both manufacturers and users.

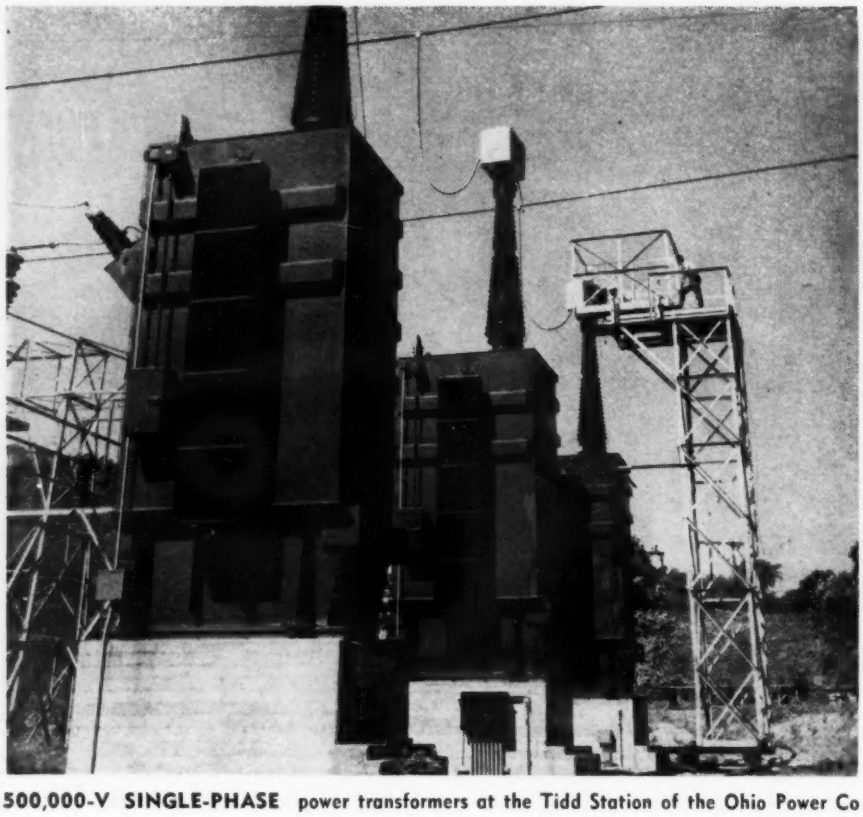
Engineers found that electrical sheet steel can be processed to orient the grains or crystals, that is, so that as compared to the older hot-rolled steel sheets, it can carry much more flux in one direction than the other. This new grain-oriented, high-permeability steel enabled transformer designers to reduce further the size and weight of the core, and at the same time improve its performance.

Shell-Form Construction

The old argument as to whether the core or shell form of construction is better has, or at least should have, largely disappeared. The facts are that the core form is more advantageous for small kva capacities and lower voltage classes, while the shell form presents many advantages for the larger kva ratings, heavier current, and higher-voltage classes. Consideration of the basic difference in construction of the two forms of transformers make this apparent.

The problems of attaining adequate insulation strength, mechanical strength, and cooling are not major problems in small- and medium-size low-voltage power transformers, so for this class of apparatus the core form is entirely adequate and, at the same time, more economical than the shell form. However, the design of large, high-voltage power transformers revolves about the proper solution of insulation and mechanical and thermal stress problems, and these can be more easily and more economically solved with the shell form. While the line of demarcation between the two forms is not distinct, the core form is generally considered to be preferred for 132,000 volts and below and for 10,000 kva and below, and the shell form is better when either the voltage or the kva exceed these limits.

In the shell form, the surges impressed on the windings are dis-



500,000-V SINGLE-PHASE power transformers at the Tidd Station of the Ohio Power Co

tributed more or less uniformly throughout the windings without the aid of auxiliaries such as shields, etc. Also it is easier to brace these transformers against mechanical stresses developed in large units when the secondary is short-circuited. The fundamental reason for this is that in the shell form, unlike the core form, the windings are completely supported in steel.

For large transformer ratings, it is likewise easier to cool both the core and windings when shell-form construction is used. Here practically all oil ducts are vertical including those for cooling the core. This construction thus takes advantage of the natural "chimney" effect. The core form usually entails some horizontal ducts. With these, a little more urging is required to force the oil through.

Tank Shape Conforms

The fact that the core of a shell-form transformer encloses the windings leads to the third major development, the "Form-fit" tank for large units. Prior to introduction of Form-fit construction, the core and coils of a transformer of either type made up one integral assembly that was inserted in the enclosing tank. The base, cover, bushings, and accessories comprised another assembly. In the Form-fit construction, the tank is shaped to fit snugly around the transformer "works". The bottom supporting end-frame for the core-and-coil unit and the base section of the transformer tank are all one piece. The core and coils are built into this receptacle. The transformer is then completed by setting the top part of the tank down over the upper extension of the core and coils. For field maintenance, therefore, it is unnecessary to lift the complete core-and-coil assembly into and out of the tank. Only the top section of the tank need be lifted. This saves time, equipment and head room in both factory and field locations.

Such a transformer can be turned on its side for shipment, thereby permitting much larger units to be shipped completely assembled. It is unnecessary to dry out, fill with oil and blow out the gas space in the field.

A newly-developed oil conditioner can be used to maintain transformer oil in the best possible condition during operation.

Forced Oil Cooling

Modern compact design lends itself advantageously to forced-oil cooling. Because of the small amount of space between tank wall and core, practically all oil pumped through the transformer must flow through ducts provided to cool the windings and core. Only a small amount bypasses the windings by flowing along the inside surfaces of the tank wall.

This arrangement, therefore, is a natural for the "triple-rated" transformer, which has three very real ratings, depending on whether it is self-cooled, forced-oil cooled, or both forced-oil and forced-air cooled.

In spite of the increase in load, the gradient between cooling oil and copper with forced-oil cooling is actually less than for the self-cooled rating because the oil now flows along the windings and through the radiators or coolers much more rapidly than with thermo-siphon cooling.

Triple-rated transformers are particularly suitable for those applications where the basic load is only 60 percent of the peak loads. It permits the application to be met with a smaller transformer, thereby reducing the capital investment.

The three major developments in design and fabrication of power transformers, together with some economies brought about by other

Reduction in Weight and Dimensions of a Typical 10,000-kva, Single phase, 60 Cycle, 138/13.8 kv Transformer

Year	1920	1930	1947
Weights, Pounds			
Core and Coils	45,000	44,000	37,000
Case and Fittings	27,000	25,000	23,000
Oil	28,000	27,000	21,000
Total	100,000	96,000	81,000
Dimensions, Inches			
Floor Space	156 x 160	148 x 158	110 x 152
Height	280	284	256

minor factors, have resulted in a large aggregate reduction in weight and dimensions as well as improvement in insulation strength. The amount of these weight and size reductions is shown in the table.

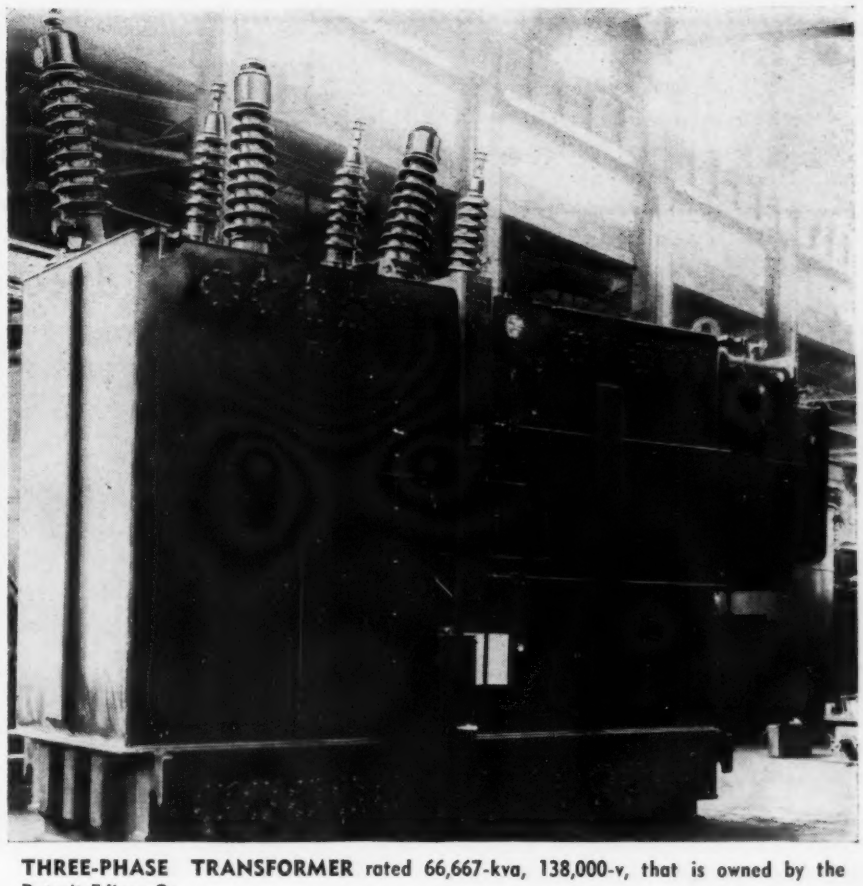
Notable Units

Several outstanding transformers, built and equipped in accordance with the foregoing, have been installed during the past year. Some of these transformers are operating at 500,000 v. This is almost double the highest operating voltage now in commercial use. These are not just testing transformers but full-fledged 5,000 kva power units, designed to withstand the normal 60-cycle operating voltage, switching surges and lightning surges experienced on a commercial 500,000-v transmission line. They are shell form, have grain-oriented steel cores and Form-fit tanks with condenser bushings similar to those on transformers that operate at 230,000 and 287,000 v.

What is believed to be the largest bank of transformers ever manufactured, 250,000 kva at 230 kv, has been installed recently by the Bonneville Power Administration at its Snohomish substation near Seattle. This bank consists of three 83,333 kva, single-phase, transformers. They have three windings, for 230 kv, for 115 kv, and primary-voltage, 13.8 kv. One of these units is shown. These transformers are triple-rated. They can be operated as a 250,000-kva bank, without air blast at 200,000 kva, and without either the air blast or oil pumps at 150,000 kva.

The largest three-phase transformer installed in this country will be the 135,000-kva, 138/15-kv unit soon to be placed in service by Detroit Edison Company. Other outstanding high-voltage power transformers recently installed include the 105,000-kva, 69-kv, 3-phase units at the Philadelphia Electric Company and the 62,500-kva 138-kv units obtained by the Consolidated Edison Company of New York. All of these transformers employ the interleaved box form of insulation structure, Hipersil cores, and Form-fit tank.

The three fundamental changes in design have resulted in the creation of a number of distinct engineering trends in the general character of large high-voltage power transformers. For example, the kva rating of many units is practically double that which was considered practicable a few years ago. There is also a definite trend towards 3-phase units. For example, Westinghouse is now building more 3-phase than single-phase units. A few years ago the single phase outnumbered 3-phase by two to one.



THREE-PHASE TRANSFORMER rated 66,667-kva, 138,000-v, that is owned by the Detroit Edison Co

There is a trend—although it is slight—toward standardization of power-transformer characteristics. For example, voltage and kva ratings, methods of cooling, and methods of oil preservation, are slowly and gradually becoming standardized. Credit for this progress belongs to manufacturers.

The average voltage level of power transformers is gradually increasing. With so much experimental work being conducted on transmission of electric power at extra-high voltages, the top operating voltages will almost certainly be lifted to at least 400,000 v and perhaps higher. This means not only higher voltage power transformers, but also means more kva in single units, inasmuch as power will be transmitted in ever larger blocks as transmission voltages increase. Transformer banks of 300,000 kva at 400,000 volts are not beyond the realm of possibility.

In general, the limit on the kva and voltage of a large power transformer is determined by shipping clearances. To ship still larger, higher-voltage units, it will be necessary to take advantage not only of the three fundamental principles of design but also of the fact that the neutrals of transmission lines operating at extra-high voltages will be effectively grounded. This will permit reduction in the insulation class of the high-voltage windings by at least one voltage class. This reduces the effective voltage of the transformer, and permits the designer to increase the kva rating without exceeding shipping clearances.

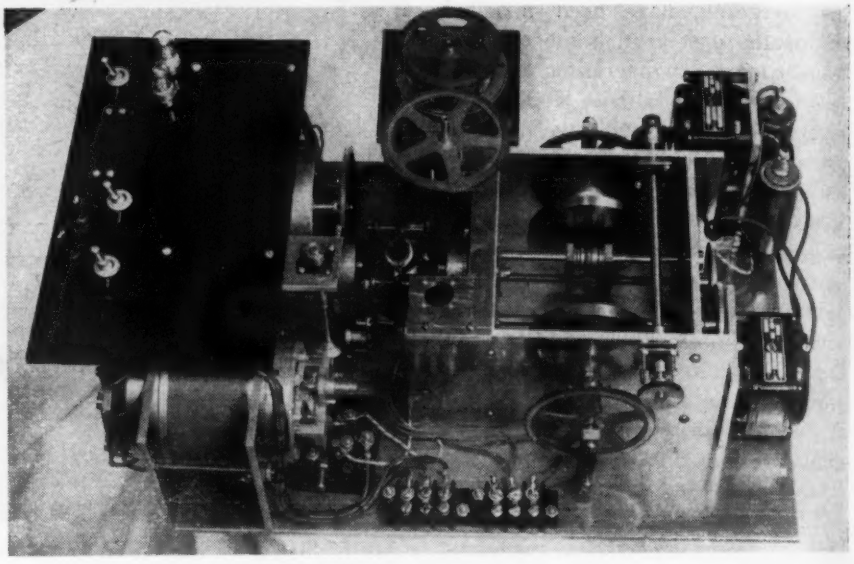
The overall weight and dimensions of large transformers can be materially reduced and the field installation expedited if the unit is forced-oil cooled instead of self-cooled. To get the largest power transformers to their destination completely assembled, it is not just desirable but necessary to use forced-oil cooling.

HOW

DESIGN • CONSTRUCT • OPERATE • MAINTAIN

Mechanical Computer Would Refine Governing

T. E. CURTIS
Pacific Gas and Electric Co
San Francisco, Calif.

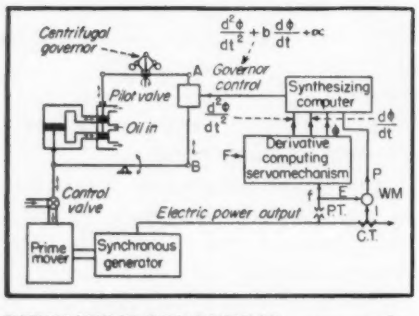


MECHANICAL COMPUTER continuously computes three primary quantities required in new approach toward ideal governing. Computer comprises two mechanical integrators in what may be called a derivative-computing servo-mechanism*

INTERCONNECTION of large power systems has complicated the problems of governing. Present governing systems, are primarily sensitive only to frequency (speed). Supplementary control is necessary to maintain power system time and the desired loading of tie lines. Time variations are usually of the order of seconds from standard time. Many desirable characteristics of operation can be gained if time variations are controlled to thousandths of a second. Control of such an order would permit transmission line phase shifts with load (torque angles), to serve rather than hinder system control.

The governing system herein proposed would enter this new realm of precision, where continuous high-speed computation can be made to determine accurately the power generation required at each controlling station in an interconnection.

Study indicates that a combination of three control components could operate governors in accordance with the computed requirements. These three control components are ϕ, the electrical phase angle between the generator voltage and a reference frequency standard (time deviation); $d\phi/dt$, the rate of change of ϕ with respect to time (frequency deviation); and $d^2\phi/dt^2$, the rate of change of $d\phi/dt$ with respect to time (angular acceleration). The latter component is anticipatory. It conveys a *load change order* to the governor immediately upon occurrence of a change in load. This gives the prime mover an appreciable period of time in which to comply with the load change order before the new angle ϕ is reached which corresponds to the new load.



DERIVATIVE-COMPUTING servo-mechanism* applied to prime mover and synchronous generator. Block diagram shows system frequency "f" and frequency standard "F" on which computation is based

Such governing action should eliminate the need for changes in generation to be greater than changes in load, since the system would be at or near normal speed as the new operating angle and power output of the generator are reached.

The proposed application of a servomechanism providing these components to a conventional governor is shown in the block diagram. It takes into account effective system inertia and combines components necessary to maintain desired load division and frequency. The output is, in effect, a continuous *load order* to the governor. It is planned to apply the computed load order to the governor synchronizing motor, making provision that the length of link A-B should follow the load order as closely and rapidly as possible.

Given a power system with two or more generating stations controlled by the proposed system, the following advantages may be anticipated:

1. Station nearest a load change would assume most of the change.
2. Stations would divide the load to minimize transmission of power.
3. Normal load level of transmission circuits would be adjustable, while still maintaining active ability to respond as desired to load changes.
4. Back-up protection would be inherent. Governing stations remote from a load change would assist as a function of relative electrical proximity to point of load change, even if the closest station were unable to cope with the situation.

* Patent applied for

5. System would not be dependent upon load telemetering channels.

6. Due to the proposed high-speed application of computed load orders to governors, it may be found that load changes can be compensated for with smaller increments of generation, as excess power would not be required to bring the system back to speed.

7. Governing action would contribute directly to stability of transmission systems, in that the basic tendency of the control systems would be to minimize torque angles. This may permit higher loading of tie lines.

8. As a by-product of the above, unprecedented precision of power system frequency and time would be obtained.

These potential gains in the art of governing appear to justify detailed studies of the proposals made.

The device was designed by the author as a result of his experience during the war with Navy ordnance fire control and computing mechanisms and his knowledge as a power system man of the limitations of present methods of governing. The writer is indebted to V. M. Marquis (American Gas and Electric) for criticism in 1941 which led to the computing scheme that has been proposed herein.

• • •

How to Cut Fire Risks in Textile Mills

OVER 90% of the fires in textile processing can be traced to three causes: foreign substance in stock; friction; and failure of electrical equipment. R. G. Shepherd, engineer, Associated Factory Mutual Fire Insurance Companies discussing electrical fire prevention in textile plants at an A.S.M.E. meeting in Boston called for proper wiring and equipment and for regular inspection and maintenance. This is supremely important where vibration is severe, as at motor terminals and connections to motor controllers.

Use of multiple-conductor flexible cord such as National Electrical Code Type SO, having a tough synthetic rubber jacket that is oil and moisture-resistant, was recommended. Flexible armored cable is less desirable for locations having severe vibration. For fastening flexible cord to the switch or motor-terminal enclosures secure, vibration-resistant connectors are favored. Semi-dust-tight enclosures (NEMA Type 1-A) are essential for switches, motor controllers and fuses in areas of severe lint conditions.

Fire prevention engineering favors dust-tight covers or globes on all lighting fixtures where there is danger from lint accumulation. Sparks from broken lamps or hot filaments dropping on stock are hazardous. Lamps on drop cords should be taboo. Pendant fixtures should be suspended by stems of threaded rigid conduit. Extension lamps should be equipped with vaporproof type globes and substantial guards. Attachment plugs and receptacles should be of the type wherein the arc is confined and extinguished within a chamber inside the device before it can be completely disconnected.

Motors or generators in dusty or linty areas should be totally enclosed unventilated or totally enclosed pipe-ventilated types. Exception is the permissive use of standard self-cleaning, squirrel-cage textile motors in areas of only moderate accumulation of lint and flyings on or in the machine. Wiring should be in either

Lifting Bar Aids Pulverizer Ring Handling

LIFTING BAR was developed for removing and replacing 1800-lb coal pulverizer rings at the Acme Station of Toledo, (Ohio) Edison Co. It eliminates most of the manual labor formerly involved in changing the heavy rings. The bar is channel section—on top is welded a segment for a chain hoist hook; underneath and near each end are bolted L-shaped pieces serving as clamps to support the ring. The arrangement was devised and built by Acme machinists

rigid conduit or electric metallic tubing.

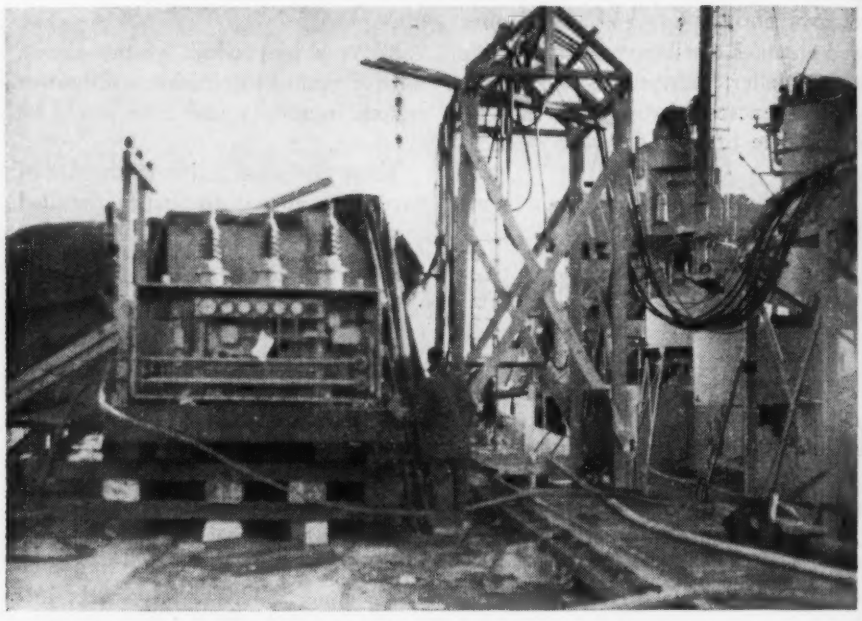
Gasoline-powered tractors, electrically operated conveyors, high-intensity radiant heat dryers, air conditioning systems, etc., all involve potential fire hazards. It is strongly suggested that plans of new processes and equipment be reviewed by insurance engineers for fire safety before installation. Such service is readily available and often results in suggestions which reduce the fire hazard. It further avoids changes after installation, with the allied expense.

Textile machinery builders and mill engineers might well incorporate magnetic separators in the design of opener room machinery or in the equipment layout. Numerous fires originating in foreign material separation from hard waste call for closer study of reclamation methods. Lubricants should always be purchased on their performance ability and never on prices.

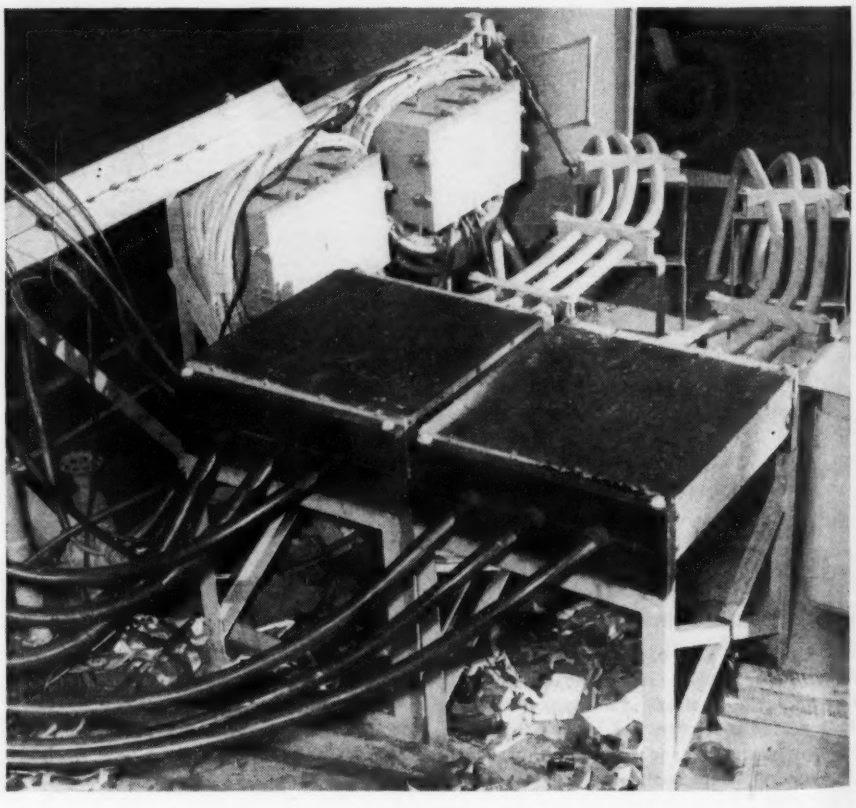
•

FOR ROCKY GOING—Because the soil around Seaside, Oregon, contains loose rock to a depth of 30 ft, orthodox hole digging is practically impossible. District Manager M. C. Thorne of Pacific Power & Light Co, above, points to the "gadget" that solved the problem. It's an open-ended metal caisson 6 ft long and 3 ft in diameter that is spotted by crane at the hole location. One man enters the "can" and throws out rock by hand while another on the outside "works" it down to keep falling rock from filling the hole as fast as it's dug

Naval "Plug-In" to Shore System Effective Despite Tidal Problem



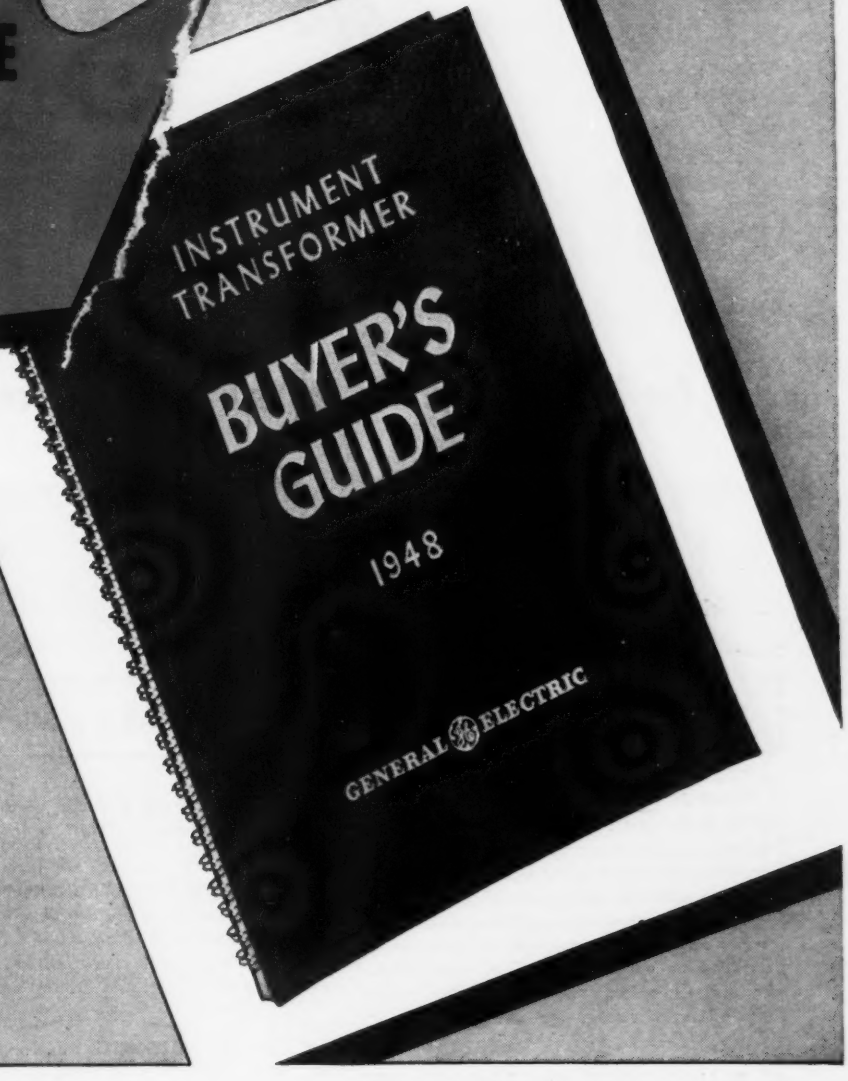
A MAJOR PROBLEM in supplying electrical energy from ship-to-shore lines is posed by ocean tides. At Portland, the destroyer escort USS *Maloy* and Central Main Power Co met this by carrying the necessary looped cables up, over and down steel structural frames between ship and shore terminals as shown above. A permanent steel frame was provided on the ship's deck. On the dock a frame was built of 6-in. x 6-in. vertical and 2-in. x 6-in. diagonal members, with cross pieces at the top. Height above the wharf was about 18 ft. Connection was by two 3-phase circuits made up of 800,000-cir mil cables. Slack was taken up on the ship side of the tie-in. A GE 3-phase transformer on the dock raised the voltage from 1,725 v to 11 kv for transmission to the nearest substation. The ship supplied about 3,600 kw to the utility. A second destroyer escort, the USS *Foss*, was moored on the opposite side of the dock for emergency supply purposes during drought conditions. The picture below shows the cable terminal boxes on the *Maloy*'s deck, a circuit being run from each of the ship's turbo-generators to the shore



latest information on

INSTRUMENT TRANSFORMERS

in this NEW 84-PAGE BOOKLET



FOR your convenience General Electric has just published a new Buyer's Guide on instrument transformers. This is a sequel to the first Buyer's Guide which proved so popular last year. It contains up-to-date information on 107 types of G-E instrument transformers for both indoor and outdoor use.

In addition to the clear, detailed illustrations on each page, you will find information on prices, ratings, and ASA accuracy classifications. All this has been combined to provide you with a handy digest of G-E Standard Transformers.

References are provided on each page to help you order supplementary bulletins containing more technical descriptions. These are free, as is the Buyer's Guide itself. Fill in coupon to get yours now. *Apparatus Dept., General Electric, Schenectady 5, N. Y.*

CLIP AND MAIL THIS COUPON TODAY

YES I need a copy of the new "Buyer's Guide" (GEA-4626) to help me in the selection of instrument transformers.

Name .....

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MAIL TO: Apparatus Dept., General Electric Co., Section A604-20, Schenectady 5, N. Y.

GENERAL ELECTRIC

GENERAL ELECTRIC ANNOUNCES

the new FR-1 relayed AUTOMATIC RECLOSER

For improved service continuity and reduced operating costs on rural lines

Here are the FEATURES . . .

1 **CHOICE OF *TWO* OPERATING FUNCTIONS . . . (convertible in the field).** (a) *Two instantaneous openings plus two time-delay openings to lock-open*— permitting an exceptionally wide range of co-ordination with a large number of fuses, due to specifically designed time-current characteristics. (b) *Two instantaneous openings to lock-closed*— permitting an extended range of co-ordination with fuses; i.e., co-ordination over an even greater range of current values.

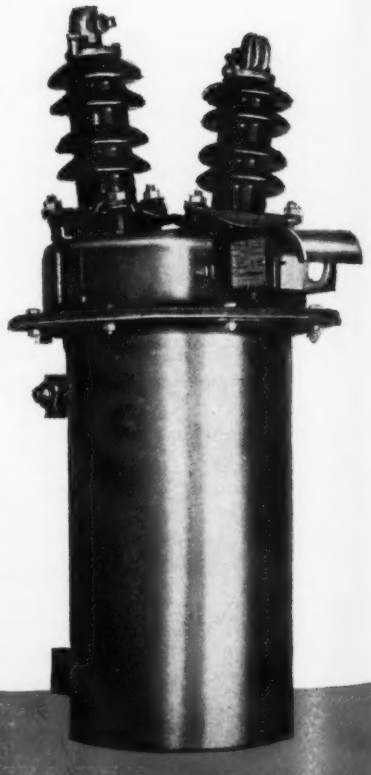
2 **AN ACCURATE *MECHANICAL-ESCAPEMENT* TIMER** . . . Precision timing, virtually *unaffected by changes in ambient temperature,* assures an unprecedented reliability of co-ordination of recloser-to-recloser and recloser-to-fuses, regardless of season.

3 **EXCEPTIONALLY FAST RE-SETTING TO INSTANTANEOUS TRIPPING** — enables clearing of rapidly recurring non-persistent faults which otherwise would cause unnecessary blowing of series fuses.

4 ***RELAY CONTROL* OF MAIN INTERRUPTER CIRCUIT** . . . Uses proved circuit-breaker principle; reduces forces on operating mechanism and achieves more accurate time-current characteristics; eliminates chattering of contacts and assures long life.

5 ***OIL-BLAST* INTERRUPTER** . . . Longer contact life, with minimum carbonization of oil, results from fast arc-extinction by same type of double-break Elkonite contacts and oil-blast interrupter used in all large G-E oil circuit breakers.

PLUS **ELEVEN OTHER IMPORTANT ELECTRICAL AND MECHANICAL FEATURES** that bring maximum freedom from inrush-current lockouts, and that simplify installation, increase safety, prolong operating life, and minimize maintenance.



Bulletin GEA-4934 gives full data, including ordering information. Ask for it today from your nearest G-E Apparatus Office or write *Apparatus Dept., General Electric Company, Schenectady 5, N. Y*

CONTINUOUS RATINGS	5, 10, 15, 25, 35, and 50 amperes
INTERRUPTING RATINGS	25 times continuous rating
MINIMUM PICK-UP CURRENT	2 times continuous rating
FOR APPLICATION ON CIRCUITS	2400 to 15000 volts

CUTS CONSUMER OUTAGE TIME...REDUCES TROUBLEMAN TRIPS

The new FR-1 Relayed Automatic Recloser is a distinctive G-E development.

Its exclusive dual-slope time-delay curve, negligible variations of timing mechanism, and freedom from effects of ambient temperatures, make it functionally superior for modern overcurrent protection.

More Reliable Co-ordination

Now, time-current characteristics stay put—remain accurate regardless of season.

The new FR-1 recloser employs a mechanical-escapement timer that is unaffected by changes in ambient temperature. It uses a relay to control, more accurately, the opening of the main interrupter.

Together, these features give a precision of time-current characteristics never before achieved. Co-ordination remains reliable, the year 'round; false operations are eliminated; there are fewer outages, and fewer service trips.

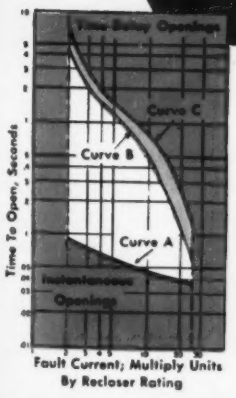
Wider Range Co-ordination

Now, co-ordination can include sectionalizing, branch-line, and transformer external or internal fuses—individually or all in series, with each recloser.

With the conventional operation—see below—it can be reliably co-ordinated with many different fuse ratings. This is because of the recloser's dual-slope time-delay curve and the year-round accuracy of its overall characteristics.

With the extended-range co-ordination operation—see below—it introduces an entirely new concept of recloser-fuse co-ordination. Here, isolation of persistent faults is accomplished entirely by co-ordination of fuses—and an even greater number of fuse ratings can be used in series with each recloser.

HERE IS THE CO-ORDINATION STORY



WITH CONVENTIONAL OPERATION—2 instantaneous plus 2 time-delay openings—a combination which has proved most efficient for minimizing the number and duration of system outages.

1 & 2—Two instantaneous openings.

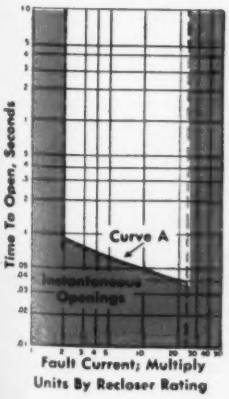
The 1st and 2nd openings are fast, with 1-second to reclose after each. Recloser will *always* trip at or below curve "A" of the chart at left, clearing all non-persistent faults with only a momentary outage, and without even partially melting fuse links coordinated with recloser.

3 & 4—Two time-delay openings.

The 3rd and 4th openings are slow, with 1-second to reclose after the 3rd opening and lock-open after the 4th. Recloser will *always* open within the upper band (between curves "B" and "C") of the chart at left, *regardless of ambient temperature*. The wide area, between Curve "A" and Curve "B" is available for reliable co-ordination of load-side fuses, permitting a choice of fuse ratings that will limit persistent faults to a minimum portion of the circuit.

5—Lock-open

Persistent faults between reclosers or between recloser and nearest load-side fuse will cause the recloser to lock open, and remain open until manually reclosed. The lock-open operation does not interfere with source-side protection because the area above Curve "C" permits reliable co-ordination with source-side fuse or circuit-breaker.



WITH EXTENDED-RANGE CO-ORDINATION OPERATION—2 instantaneous openings plus unlimited time-delay until automatic resetting—a combination extending series co-ordination with fuses, which minimizes the extent of consumer outage.

1 & 2—Two instantaneous openings.

The 1st and 2nd openings are fast, with 1-second to reclose after each. Recloser will *always* trip at or below Curve "A" of the chart at left, clearing all non-persistent faults with only a momentary outage, and without even partially melting fuse links co-ordinated with recloser.

3—Lock-closed

After the two instantaneous openings, the recloser locks closed. This introduces, in effect, an unlimited time-delay (until automatic resetting)—with persistent faults isolated entirely by co-ordinated fuses.

As shown in the chart at left, the area for co-ordination of recloser with both load-side and source-side fuses extends upward from Curve "A" *with no upper limit*, since there is no time-delay tripping characteristic. This function permits a maximum number of fuses to be co-ordinated in series with each recloser, thus increasing the number of available sectionalizing points.

4—Automatic reset

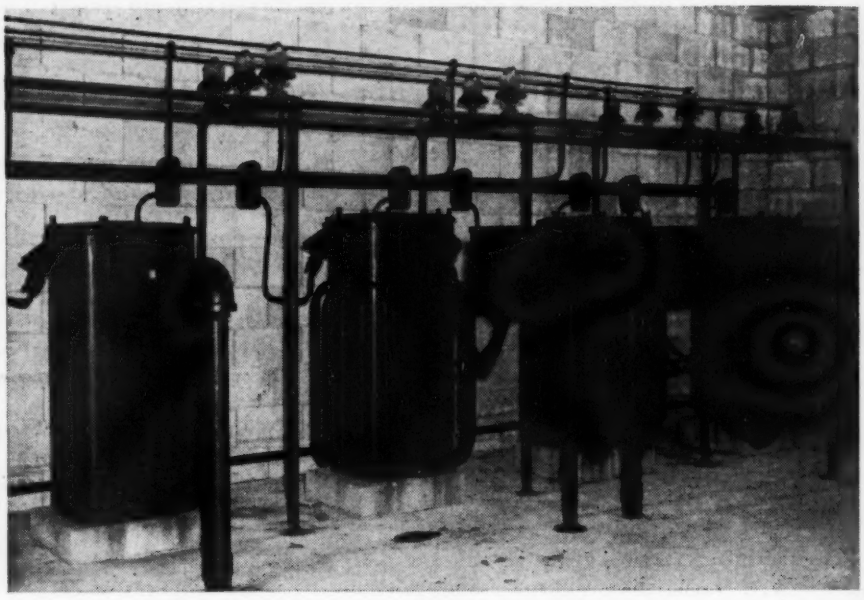
Immediately after a fuse has isolated the persistent fault, the recloser automatically resets. Service is restored and maintained everywhere except beyond the blown fuse.

GENERAL ELECTRIC

406-23

Symmetrical Layouts Aid Substation Economy

WHERE SPACE PERMITS, clear-cut transformer and wiring layouts have decided advantages in industrial substation work. This illustration shows such benefits in a plant devoted to air transportation service. Continuous electrical supply rated high in importance here. A suburban location gave ample room for separation of units. Incoming supply at 2.3-kv is carried by open copper bus construction on bus type insulators mounted on pipe frame. Vertical taps through cutouts are run to the single-phase transformers, as shown. One cutout per phase wire is provided. At the left a 50-kva transformer serves a 120-v lighting system inside the plant. The other transformers, 75-kva each, deliver 3-phase, 240-v energy to motors. Power on the secondary distribution system is carried via metal-clad bus and feeder, also via cable through iron conduits dropping vertically to the concrete floor of the transformer area, and then is run inside the building. The simplicity and symmetry of the installation virtually constitute a wiring diagram of maximum clarity. Installation was correspondingly straightforward and rapid, and maintenance reduced to minimum terms. Switching and metering are handled within the plant, thus insuring convenient circuit control and simplifying the outdoor layout procedure.

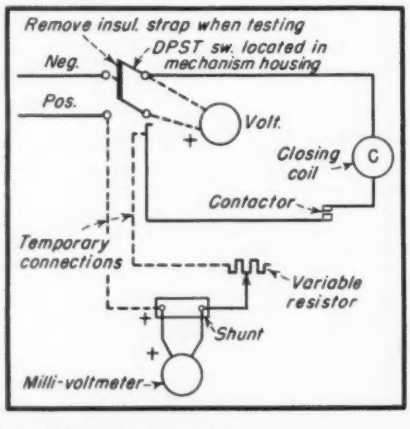


SIMPLE WIRING LAYOUTS permit rapid installation and provide for reduced maintenance. Supply is shown here carried by open copper bus construction on bus-type insulators

• • •

Measure Closing Currents of Oil Circuit Breakers

IN THE MAINTENANCE procedure of oil circuit breakers, directions for measuring normal and minimum closing currents and voltages have been prepared by West Penn Power Co, Pittsburgh, Pa. Following steps are an adaptation from the company's station maintenance manual.



CONNECTIONS FOR measuring normal and minimum closing current and voltage of oil circuit breakers. Caution: Voltmeter is not to remain connected to circuit. Press pushbutton only while taking reading. Failure to do this will naturally result in a ruined voltmeter

1. Remove control fuses and open dpst knife switch in mechanism housing.

2. Connect shunt and variable resistor to positive side of knife switch as shown on drawing. Be sure this resistor has enough carrying capacity to carry the closing coil current without excessive heating. Also remove insulating strap holding the two knife blades together.

3. Connect a d-c ammeter and a d-c voltmeter with polarity as shown. Be sure the voltmeter scale is larger than the battery supply voltage.

4. Replace fuses and close negative blade of knife switch. Leave control switch on the switchboard in neutral position.

5. Using an insulated hammer handle, fuse tongs, etc, close contactor and read normal closing current and voltage. To measure minimum closing current and voltage, adjust resistance until breaker barely closes and latches closed when control relay is held in closed position; then read minimum closing current and voltage. Do not overheat closing coil by keeping it energized too long. An overheated coil requires more voltage to close. Do not look directly at the arc in the contactor.

6. If new installation, also measure voltage at switchboard, at control fuses, and at battery terminals with the closing coil energized. It is also desirable to measure minimum closing current and voltage each time the breaker is being completely inspected.

Caution: Be sure shunt (or ammeter) is large enough to carry closing coil current. If in doubt, use about a 200-amp shunt and watch deflection of needle. If the needle swings violently when switch is closed, the shunt is too small. First, read current on large ampere shunt and then install a smaller ampere shunt, if necessary, in order to get a more accurate reading.

The measurement of a direct cur-

What's new in GE street lighting

the MOST *modern* LUMINAIRE FOR *white-way* LIGHTING

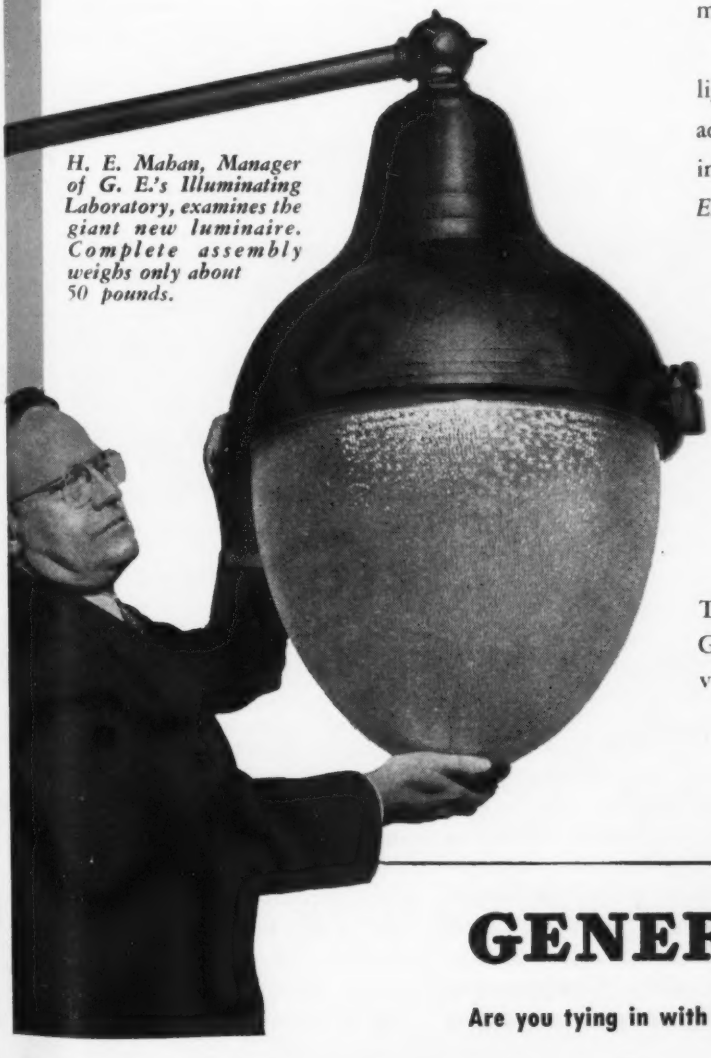
For the cities that want truly outstanding lighting for their main business streets here is a good solution. General Electric's new Form 108 luminaire combines impressive, modern appearance with average illumination of at least 2½ foot candles.

The Form 108 puts more light on the street than comparable previous units. New reflector design offers scientific light distribution with comfortable, highly attractive illumination. Asymmetry is provided without shields.

This new luminaire takes the largest size lamps. It will accommodate either a 25,000-lumen series or 1,500-watt multiple filament lamp, or two 400-watt mercury lamps.

Exceptionally good shielding is incorporated in the Form 108 for eye comfort. The light source is shielded at an angle of 25 degrees below the horizontal, 10 degrees lower than is customary with most modern luminaires.

With the new and growing interest in white-way lighting, the Form 108 luminaire is a streetlighting achievement you will want to investigate. For further information write to *Apparatus Department, General Electric Company, Schenectady 5, New York.*



H. E. Mahan, Manager of G. E.'s Illuminating Laboratory, examines the giant new luminaire. Complete assembly weighs only about 50 pounds.

Looking up into luminaire with globe and globe holder removed. The reason for Form 108's excellent light distribution is this new, scientifically-designed, accurately-formed Alzak aluminum reflector.*

GOOD STREET LIGHTING BUILDS GOOD WILL

This new White-way luminaire is another of General Electric's contributions to help you provide better street lighting at lower cost.

**Manufactured under patents of the Aluminum Co. of America.*

GENERAL ELECTRIC

452-60

Are you tying in with the NEMA plan to give America better street lighting?

rent is usually made by (1) an ammeter or (2) a shunt and millivoltmeter. The explanation of the use of a shunt and millivoltmeter to measure direct currents is as follows:

The shunt is connected in series in the circuit in exactly the same manner as the ammeter. It is customary to design a 100-amp shunt (for example) so that when 100 amp are flowing through it, there will be 50 millivolts (0.05 volt) drop between the two small clamping screws on the shunt. A millivoltmeter having 50 millivolts drop for full scale deflection is connected to the shunt, as shown in drawing, being sure polarity is correct. Be sure to use the calibrated leads that go with the instrument. Thus, when there is 100 amp flowing in the shunt, there will be 50 mv, or full scale reading on the instrument. This reading represents 100 amp. Likewise, if the instrument reads 25, there will be 50 amp. The size of the shunt may be changed so that there will be 50 mv drop across it when there is about 1, 10, 50, or 1,000 amp, etc, flowing in the shunt. From this it is seen that one can measure almost any ordinary direct current with one millivoltmeter and a number of shunts.

The formula for calculating the current in a shunt is as follows:

$$\text{Current} = \frac{\text{reading on millivoltmeter}}{\text{full scale reading of millivoltmeter}} \times \text{ampere rating of shunt}$$

Many prefer to get a constant which is equal to the following:

$$\frac{\text{ampere rating of shunt}}{\text{full scale reading of millivoltmeter}}$$

The amperes in the circuit are then equal to the millivoltmeter reading multiplied by the above constant.

Caution: Extreme care should be taken that the nameplate millivolts drop on the shunt is exactly the same as the rated millivolts on the millivoltmeter.

Shock Mounts Protect Meters During Transit

E. B. KIPP
Superintendent, Electric Meter Department
San Diego Gas & Electric Co

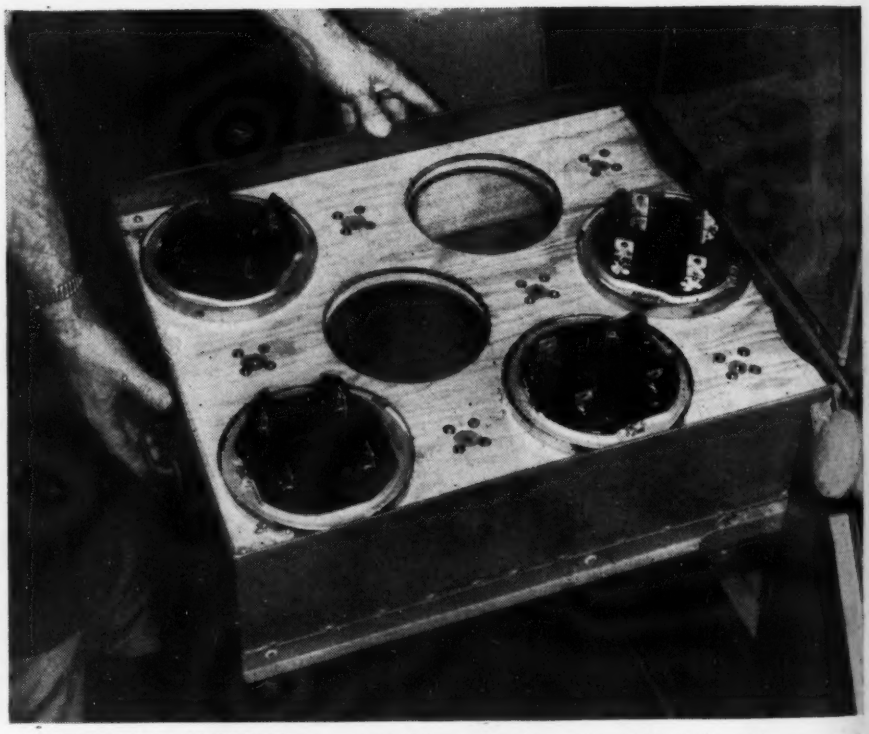
SUPPORTING SOCKET-TYPE meters by the cover ring while being transported is not new, but the use of shock-mounts to protect the meters against damage from vibration and road shock is believed to be an innovation.

A plywood carrying-case incorporating the shock-mounts as illustrated, fits into one of the metal drawers of the service truck. Shock-mounts are of the Lord Series 100 type and are available in various load-carrying capacities. The No. 8 size has been found to give very satisfactory results. Eight of these shock absorbers are mounted between two pieces of plywood which have large holes to accommodate light meters. With this type of support, the meters "float" on a rubber cushion. There is no tendency for the cushioning material to pack down or wear through.

Sound Construction

The plywood is left in its natural state but is treated with an oil preservative to prevent warping. All joints are nailed and glued, and nuts are soldered to screws to prevent loosening. This careful construction is necessary because of the hard use these cases receive.

So successful was the first unit built two years ago, that the San Diego Gas & Electric Co now has all its trucks equipped with similar units that are designed to hold from four to nine meters.



METERS IN TRANSPORT are protected from vibration and road shock by rubber-mounted carrying rack placed in metal drawer of truck

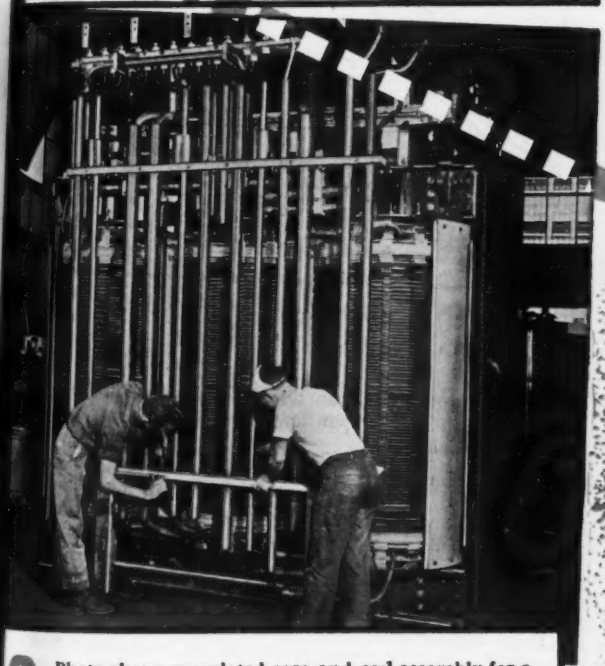
Cutting Fire Hazards Around Induction Heaters

ASSOCIATED FACTORY MUTUAL Fire Insurance Companies recommends attention to the following safety standards for high-frequency induction heater installations:—(1) Inclose the unit completely in a non-combustible housing, preferably metal; (2) Provide ample ventilation by a fan taking air through a reliable filter system to reduce combustible and conducting dust; (3) Insist on flame-proof insulation for wiring.

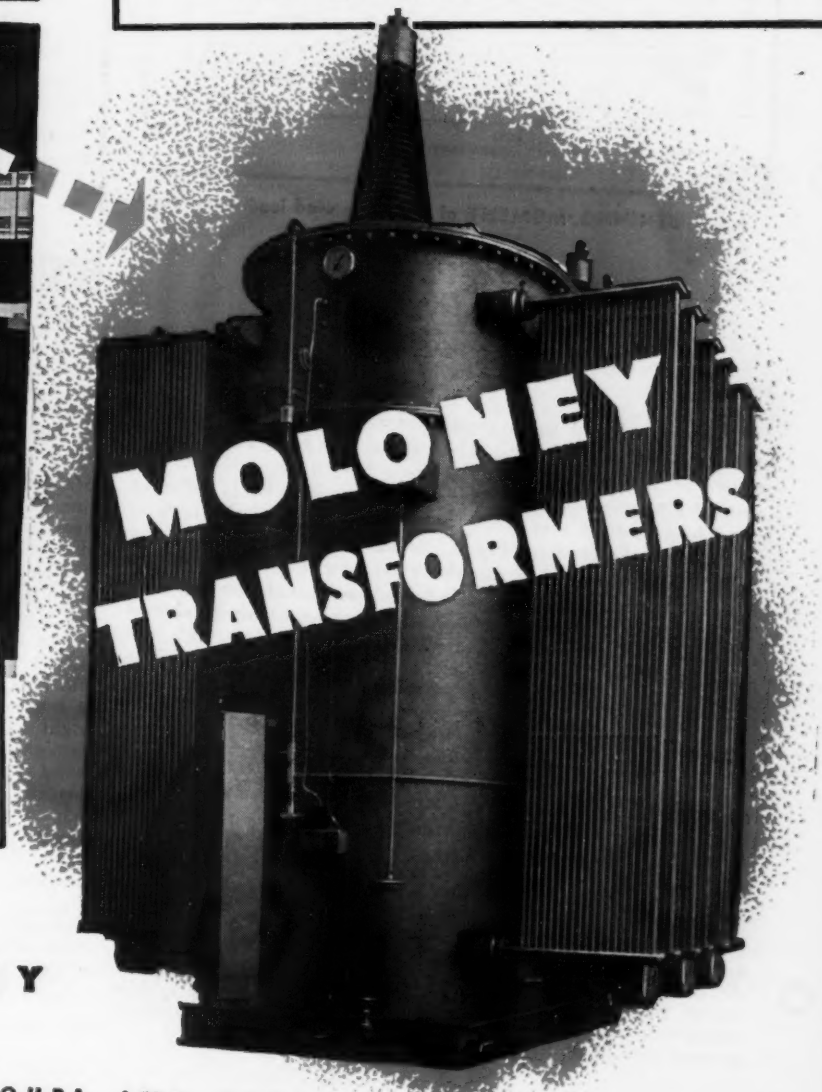
These precautions are the result of engineering study of fire risks associated with the selection of industrial high-frequency induction heaters. A typical fire occurred in a spark-gap unit in an eastern metal-working plant. Severe arcing of the selector switch contacts ignited combustible

2 Pressboard spacers separate the individual disc coils and are fastened to the spacer bars which provide the vertical oil ducts between windings. This permits accurate alignment, providing mechanical strength to withstand the forces encountered under short circuit conditions. Connections between coils are gun-brazed as shown in the photo, and then thoroughly insulated.

3 Following assembly of the stack of disc coils into a continuous winding, it is compressed to the proper vertical dimension, securely clamped, then subjected to a series of drying, varnish impregnating and baking operations. These serve to (1) remove moisture from the insulating materials, (2) seal the windings against moisture, (3) provide mechanical strength for ease of handling when installing the winding on the core.



6 Photo shows completed core-and-coil assembly for a small three-phase power transformer, ready for preliminary testing. Leads are anchored firmly by means of insulating tubing. Lead connections have been carefully brazed and insulated. Insulating shields have been placed between phases and between the end plates and the windings.

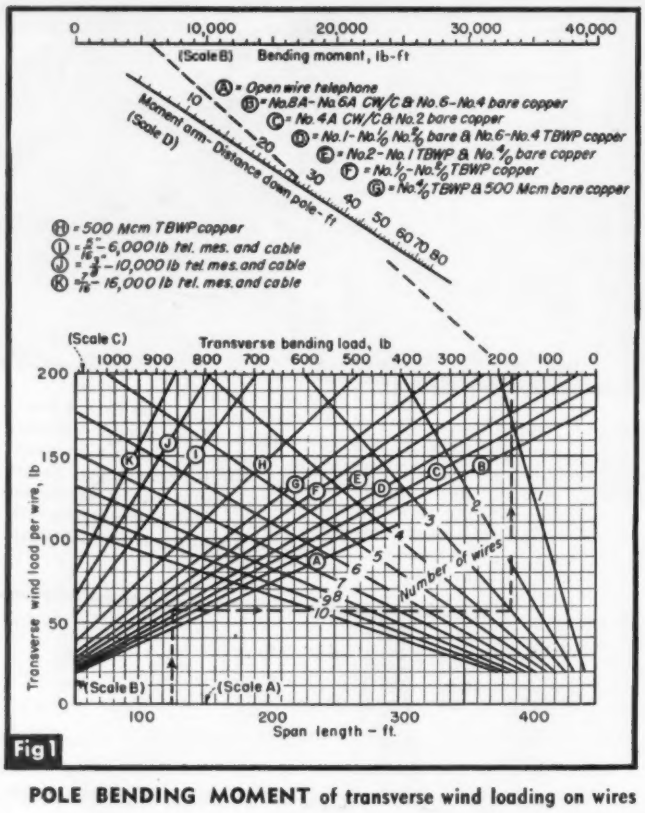


MOLONEY TRANSFORMERS

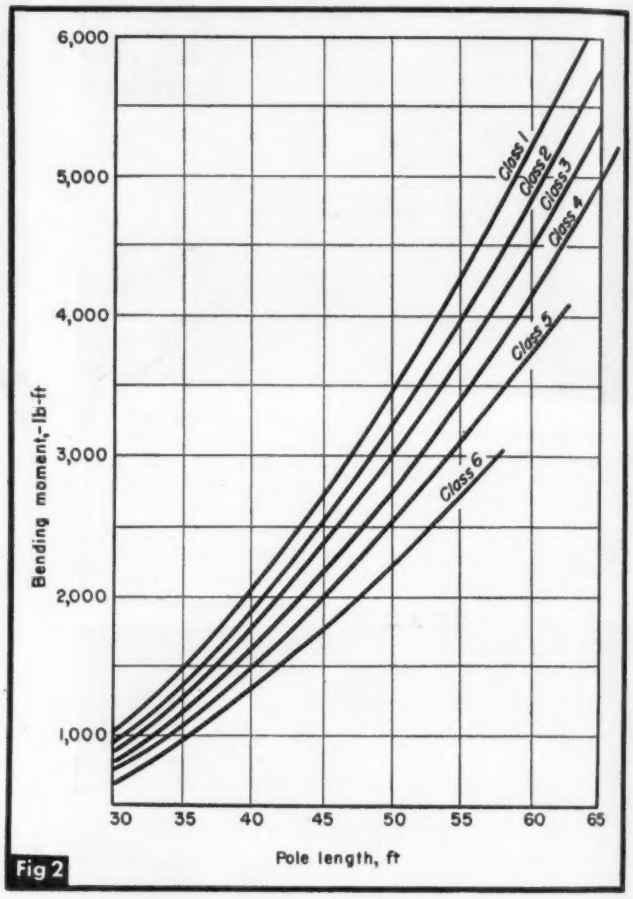
LECTRIC COMPANY

ACTORIES AT ST. LOUIS, MISSOURI AND TORONTO, ONTARIO, CANADA

Mechanical Loading of Wood Poles



POLE BENDING MOMENT of transverse wind loading on wires



BENDING MOMENT at ground line due to wind on pole

E. M. ADKINS
Jersey Central Power & Light Co
Asbury Park, N. J.

Charts are based upon requirements of the latest revision (5th edition) of the NESC. The curves A to K of Fig I simply represent the relation between span length on scale A and resulting transverse wind loading shown on scale B. If different wind loading than that given in the 5th edition of the code is to be used, the chart of Fig. I can be used by calculating the wind pressure per wire for the span length to be used and locating the corresponding wind load in pounds on scale B. This point, representing wind load per wire on scale B, should then be projected horizontally to an intersection with the number of wires involved at the right of the chart. The procedure from this point is as given before.

EXAMPLE 1

GIVEN: A 34.5-kv circuit consisting of three No. 2/0 bare copper conductors, a distribution circuit consisting of three No. 4/0 TBWP copper conductors, two No. 6 TBWP copper series street light wires and three No. 4 TBWP copper secondary conductors are to be mounted on 40-ft pine poles. The 34.5-kv circuit is to be mounted on crossarms in the top gain of the pole, at a distance of 33 ft above ground. The primary circuit and the series circuit will be mounted on crossarms 6 ft below the 34.5-kv circuit; with a moment arm of 27 ft. The secondary circuit will be mounted on vertical racks so that the middle conductor is 3 ft below the primary crossarm; with an equivalent moment arm of 24 ft above ground.

The line is to be built in urban territory, to withstand heavy loading conditions and with a span length of 125 ft. What class of pole will be required?

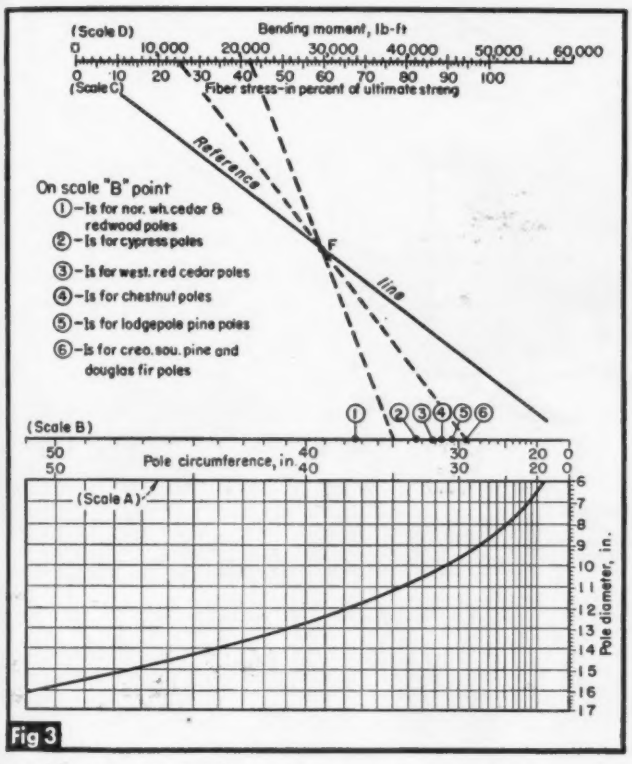
SOLUTION: 1—Referring to Section 24 of the NESC, such a line requires Grade B construction. The transverse load, under heavy loading conditions, must not cause a bending stress exceeding 25% of its rated ultimate strength at the time of installation.

2—Bending moment on the pole caused by the transverse force of wind blowing on ice-covered conductors, under heavy loading conditions, is found by use of the chart Fig 1.

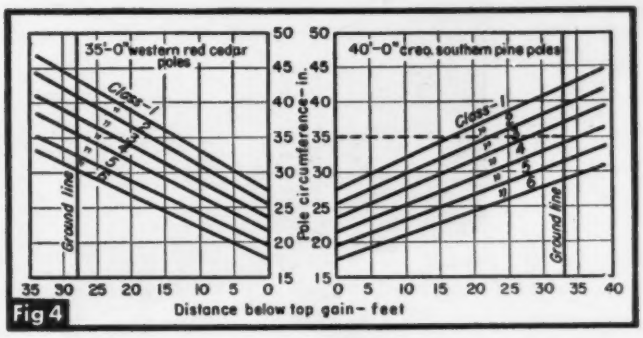
For the three 34.5-kv conductors, start from a span length of 125 ft on scale A. Project a vertical line to its intersection with curve D for No. 2/0 bare copper wire. From that point, project a horizontal line to an intersection with the radial line at the right for three wires. Then project a vertical line to an intersection with scale C, giving the transverse side pull due to wind on three No. 2/0 bare copper conductors under heavy loading conditions. From that point on scale C, lay a straight edge across scale D for a moment arm of 33 ft. Read the bending moment on the pole at the ground line on scale E. Dashed lines shown on Fig 1 illustrate the method described. Total bending moment due to wind on the various conductors is:

Copper Conductors	Moment Arm, ft	Bend Mom. lb-ft
3 No. 2/0 Bare	33	5,700
3 No. 4/0 TBWP	27	6,200
2 No. 6 TBWP	27	3,100
3 No. 4 TBWP	24	4,100
Total		19,100

Accompanying charts offer a simple, quick and accurate means of checking maximum loading anticipated against minimum requirements of the National Electrical Safety Code, Part 2, Fifth Edition, Sept. 23, 1941 (latest revision to date). Three examples illustrate use of charts in checking design and construction of overhead supply lines



POLE CIRCUMFERENCE determined from permissible bending moment and fiber stress



REQUISITE POLE CIRCUMFERENCE fixes class of pole

3—Approximate bending moment at the ground line due to wind on the pole is shown in Fig 2 for various lengths and classes of poles. Tentatively selecting a Class 2 pole, the bending moment is read as 1900 lb-ft. Total bending moment on the pole is:

Bending Moment due to wind on:	lb-ft
Conductors	19,100
Poles	1,900
Total	21,000

4—Refer to chart Fig 3, showing the relation between pole circumference and bending moment. Lay a straight edge from point 6 on scale B, for creosoted yellow pine poles, to the maximum allowable stress in percent of ultimate strength, or 25%, on scale C. Locate point F where that line crosses the reference line. Now swing the straight edge in line with point F and bending moment of 21,000 lb-ft on scale D, and read minimum pole circumference, at the ground line, of 35 in. on scale A.

5—Refer to chart Fig 4, showing the circumference of various classes of 40-ft southern pine poles. Read across from a circumference of 35 in. to an intersection with the vertical line representing the ground line distance from the top gain. It is seen that a 40-ft pole having a 35-in. circumference at the ground line falls between a Class 3 and a Class 4 pole. In order to meet NESC requirements, a Class 3 pole having a ground line circumference of 37 in. will be required.

EXAMPLE 2

GIVEN: With the same conditions of Example 1 and a Class 3 pine pole having a minimum ground line circumference of 37 in., suppose the pole has decayed to a depth of 1 in. at the ground line. Should the pole be replaced?

SOLUTION: 1—Refer to the chart Fig 3. Start with a circumference of 37 in. on scale A, read the original diameter 11.75 in. on scale E.

2—Since the pole has decayed to a depth of 1 in. at the ground line, the pole diameter of undecayed wood is equal to 11.75 in. minus 2 in., or 9.75 in. Starting with a diameter of 9.75 in. on scale E, the circumference of undecayed wood, or 30.6 in., is read on scale A.

3—Laying a straight edge across 30.6 in. on Scale A and a bending moment of 21,000 lb-ft on scale D, a reference point is located on the reference line. At that point on the reference line, swing the straight edge in line with point 6 on scale B, for creosoted southern pine poles. Fiber stress may be read on scale C as being equal to 37.5 percent of its rated ultimate strength.

4—NESC specifies that the pole shall be replaced when the transverse loading causes a bending stress equal to 37.5 percent of its ultimate strength. The pole should be replaced since further decay will result in stresses beyond the 37.5 limit of the NESC if it is subjected to heavy loading conditions.

EXAMPLE 3

GIVEN: A 4800-volt rural line is contemplated, consisting of three No. 4A Copperweld/copper primary conductors in joint use with a 6-wire telephone line on 35-ft, Class 6, WRC poles. What is the maximum allowable span length, under heavy loading conditions, so as not to exceed NESC limits for transverse loading?

SOLUTION: 1—NESC specifies that such a line shall be Grade C construction and that the fiber stress under transverse loading shall not exceed 50% of the rated ultimate strength of the pole when installed.

2—Referring to Fig 4, the minimum circumference at the ground line, of a Class 6, 35-ft. WRC pole is found to be 30.5 in. The distance from the the top gain to the ground line is 28 ft and the moment arm for the open wire telephone line is taken to be 20 ft.

3—Refer to Fig 3 and lay a straight edge from point 3, for WRC poles, on scale B to 50% stress on scale C, locating a point on the reference line. On the reference line point, swing the straight edge to a circumference of 30.5 in. on scale A and read the maximum allowable bending moment of 20,900 lb-ft on scale D.

4—Refer to Fig 2 and read a bending moment of 975 lb-ft. due to wind on a 35-ft, Class 6 pole under heavy loading conditions. The allowable bending moment due to wind on conductors, then, is equal to 20,900 lb-ft minus 975 lb-ft, or approximately 19,900 lb-ft.

5—Referring to Fig 1, the bending moment due to the transverse force of wind on conductors, for a span of 100 ft, for three No. 4A Copperweld/copper wires 28 ft above ground and six telephone wires 20 ft above ground, is found as explained in Example 1. This is equal to 3600 lb-ft for the primary wires and 4400 lb-ft for the telephone wires, making a total bending moment of 8000 lb-ft per 100 ft of span length under heavy loading conditions.

6—Allowable span length is:
(19,900 lb-ft ÷ 8000 lb-ft) 100 = 249 ft.

This battery of 110-kv transformers has been operating with O-B bushings since August 15, 1920 — approximately 28 years — giving complete satisfaction and leading to many subsequent installations based upon this performance.

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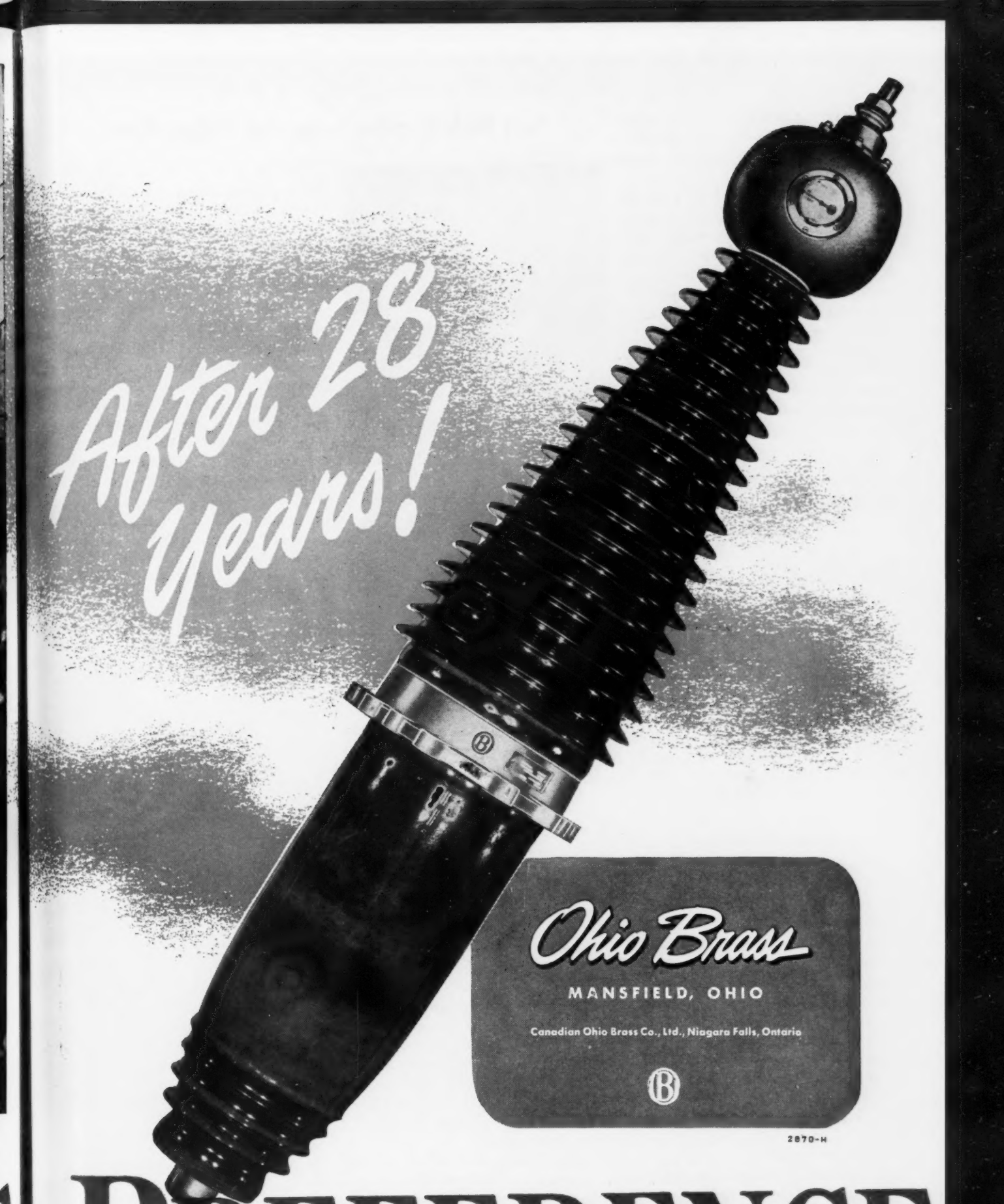
BUSHING


After 28 Years!
Ohio Brass
MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ontario
2870-H

PREFERENCE

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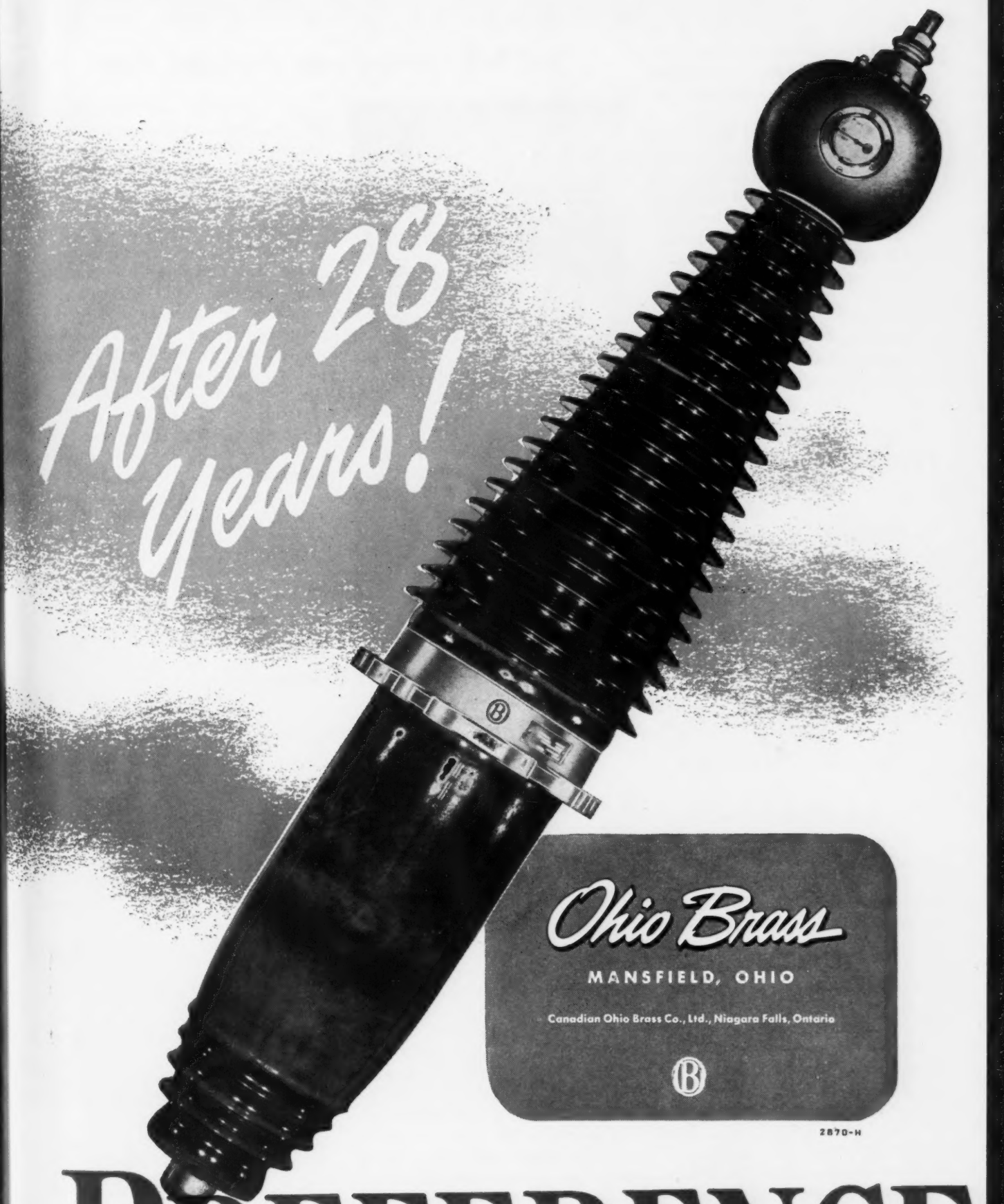
BUSHING


After 28 Years!
Ohio Brass
MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ontario
2870-H

PREFERENCE

wire covering and the wooden frame of the housing. The fire destroyed the unit, causing serious interruption to production.

Another fire occurred at a metal conduit plant. Spontaneous heating of spilled castor oil in contact with cotton wadding ignited the insulation and the wooden cabinet. The resulting fire seriously damaged the unit. It had to be returned to the manufacturer for repairs.

These episodes do not indicate that high-frequency heaters are a menace to industry, but emphasize the great importance of specifying fire-preventive designs and installation.

•

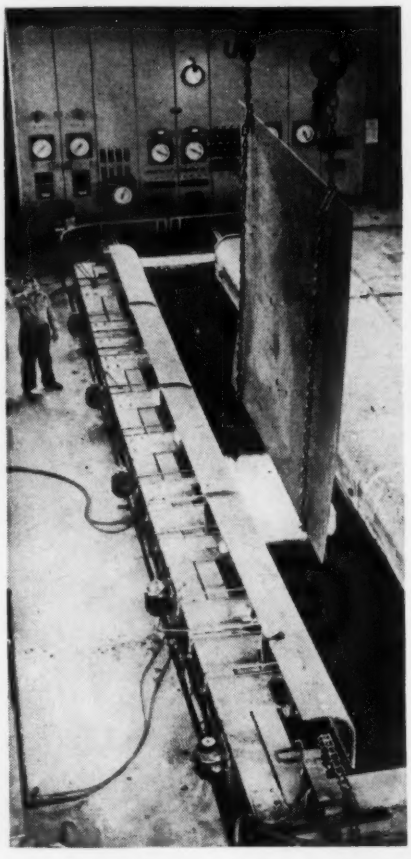
Post-Repair Tests Ward Off Failures

INVESTIGATION of a 2,000-kva outdoor transformer failure which cost the industrial customer of an electric utility over $3,000 emphasized test needs. One phase failed; oil was splashed on the top and sides of the unit, also on the ground. This indicated arcing within the transformer. The accident blew a high-tension fuse on one phase of the primary circuit on a pole near the unit, and opened the main breaker in the utility substation.

Transformer Rented

The transformer was at once cut out of service. A 1,500-kva unit was fortunately rented from a utility to carry the load of one mill section, 1,400 kw. The other 2,000-kva transformer on the premises was uninjured. No power system disturbance was noted. The transformer in trouble had failed eight months before when a substation attendant kept reclosing the breaker under system short-circuit conditions, until the transformer quit business. It appeared after the later accident that an error had probably been made in rewinding the unit after the previous trouble. Before being reinstalled insulation tests gave readings of 2,000 megohms in each case between high and low-tension windings, and between each winding and ground. High-potential tests were recommended after all future repairs on equipment of this type.

Salt Bath Handles Large Hot-Rolled Plate



SALT BATH furnace is used for descaling process, has large working dimensions, 40 ft long, 4 ft wide, 11.5 ft salt depth, holds 165 tons of salt, and has 800 kw input

THE PROBLEM OF SCALE removal from hot-rolled clad plate and sheet was solved by the Lukens Steel Co, Coatesville, Pa., by the adoption of the molten salt bath descaling process. One significant feature of the bath is its ability to handle large work.

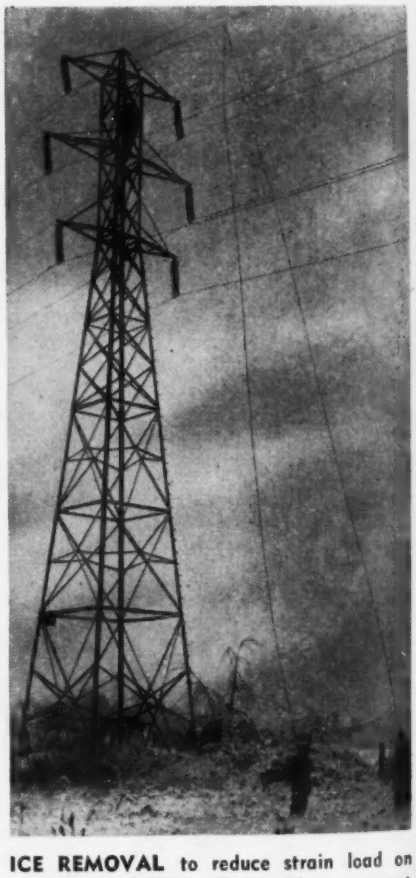
This salt bath system supplants the former acid pickling process. It has shown technical and economical advantages. A saving in metal has been realized since the salt bath treatment removes only the scale and does not attack the base metal. Time required to remove the scale has been materially reduced and a more uniform descaling has resulted without pitting or hyrogen embrittlement.

The new process involves an Ajax Hultgren electric salt bath furnace. The bath, consisting of molten sodium hydroxide with the addition of sodium hydride, has working dimensions: 40 ft in length, 4 ft in width, 11 ft 6 in. salt depth. It has a power input of 800 kw and is heated by the immersed electrode principle. The furnace holds 165 tons of salt.

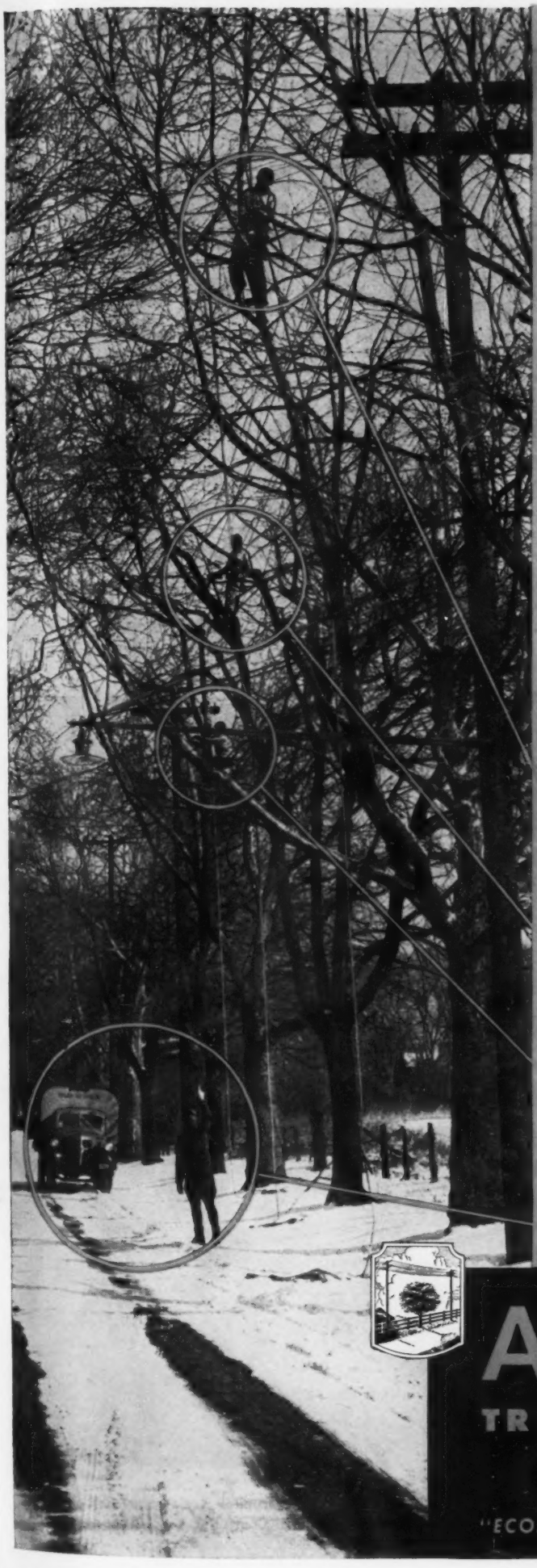
In the descaling process, work to be cleaned is merely placed on racks so that all surfaces are reached by the bath. The pieces are immersed at 700 F until the reducing cycle is completed. This time varies from 8 to 20 min depending on the thickness and weight of the plates as well as the particular type of metal or alloy being cleaned. After the scale is completely reduced and while the work is still hot, it is immersed in water. This removes a large portion of the reduced material. A high pressure water rinse removes traces of caustic soda and a flash dip in acid produces a bright surface. Another high pressure rinse removes traces of smut or acid remaining on the work.

•

Chaining Glaze



ICE REMOVAL to reduce strain load on conductors of 132-kv line. After a recent "sleet" storm Detroit Edison Co deenergized the line. A lineman on the tower placed the chain successively on the conductors and two linemen on the ground manipulated chain to break the ice from them



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LOAD BUILDING

Electrically Heated Pitch Pots Speed Lens Production

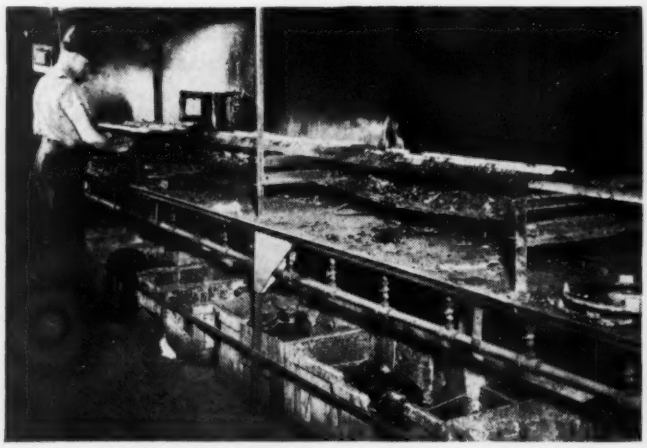
DONALD W. WHITE
Research Dept
Lancaster Lens Co
Lancaster, Ohio

REDUCED WASTE, faster production, lessened fire hazard, easier work, and cleaner and safer working conditions, are results from installation of electric pitch melting pots in the plant of the Lancaster Lens Co, Lancaster, Ohio.

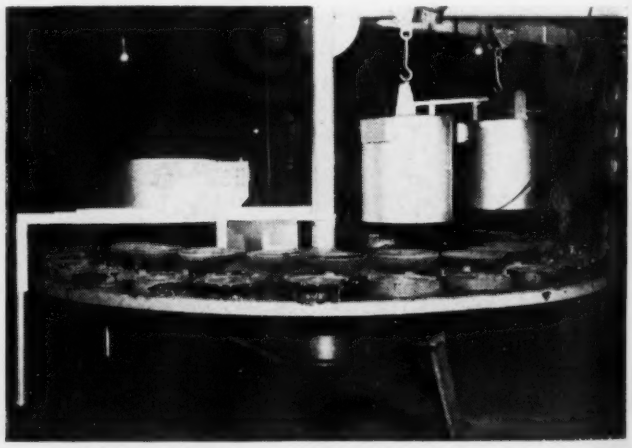
For holding them during the grinding and polishing processes, lens blanks are set with hot pitch into saucer-like blocking "tools." Cooling and hardening, the pitch grips the glass firmly. As shown in the pictures below, previous practice was for the tools to be warmed before blocking. Then they moved to a long bench where the hot pitch was ladled into them by hand and the blanks imbedded in the pitch. Following this, the assembled tools and blanks stood in the air until cooled sufficiently to handle.

The pitch was melted in an enclosed gas-heated tank, from which it flowed by gravity to an open tank kept warm by a gas fire. It was ladled manually from the open tank into the tools. All this resulted in an extremely messy job. Much pitch was wasted by dripping and the danger of fire was considerable. Temperature of the pitch was under no other control than the judgment of the operator.

The new installation, shown in the pictures below, consists of a manually-operated turntable that carries the blocking tools under the electrically heated pitch pots. The two pots, one of which melts a charge of pitch while the other is being emptied, are hung on trolleys riding on beams radial to the turntable. Each pot has

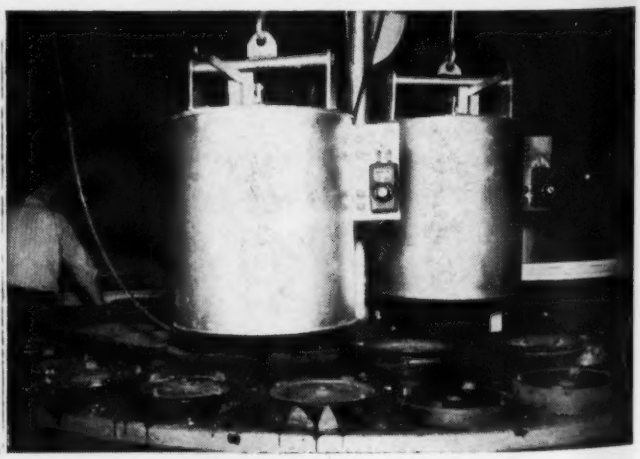


BLOCKING TOOLS for holding lens blanks during grinding operations were formerly warmed over open gas flames before receiving pitch and lens blanks



MANUALLY OPERATED turntable for moving tools under the electrically heated pitch pots includes cooling tunnel. The pots are hung on trolleys riding on beams radial to the turntable

BENCH WHERE BLANKS were formerly blocked into tools and imbedded with hot pitch. The assembled tools and blanks stood in the air until cooled sufficiently to handle

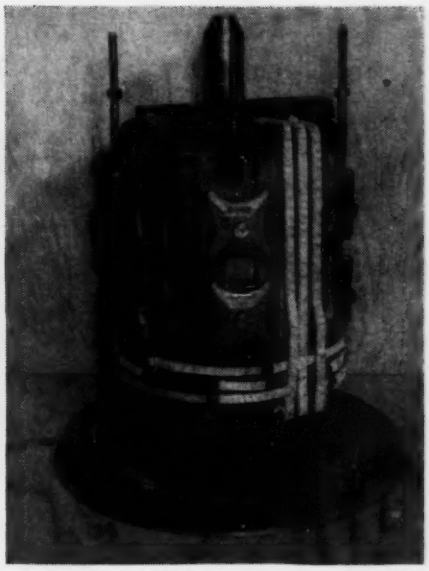


REGULATING CONTROLS for pitch temperature are mounted on pots convenient to operator. Control of heaters resides in 200-500 F bulb thermotat

a lever-operated valve by means of which the amount of pitch required for each blocking tool flows out of a spout in the bottom of the pot. Covering about a 90-deg sector of the turntable is a flat housing, making a tunnel in which the assembled blanks and tools are cooled with air from a fan.

Each electric pot consists of a cylindrical casting with closed bottom and outside-flanged top. Spout and valve are set in a hole in the bottom. Held by square utility clamps around the cylinder are 12.500-w, 230-v Chromalox strip heaters. A 1,000-w, 230-v flat ring heater is fastened to the bottom of the pot. Control of the heaters resides in a 200-500 F bulb thermostat. The housing of the pot is held to the top flange by four studs welded to the pot at the bottom.

PITCH WAS MELTED originally in this gas burner and was ladled by hand from open tank at right to the tools

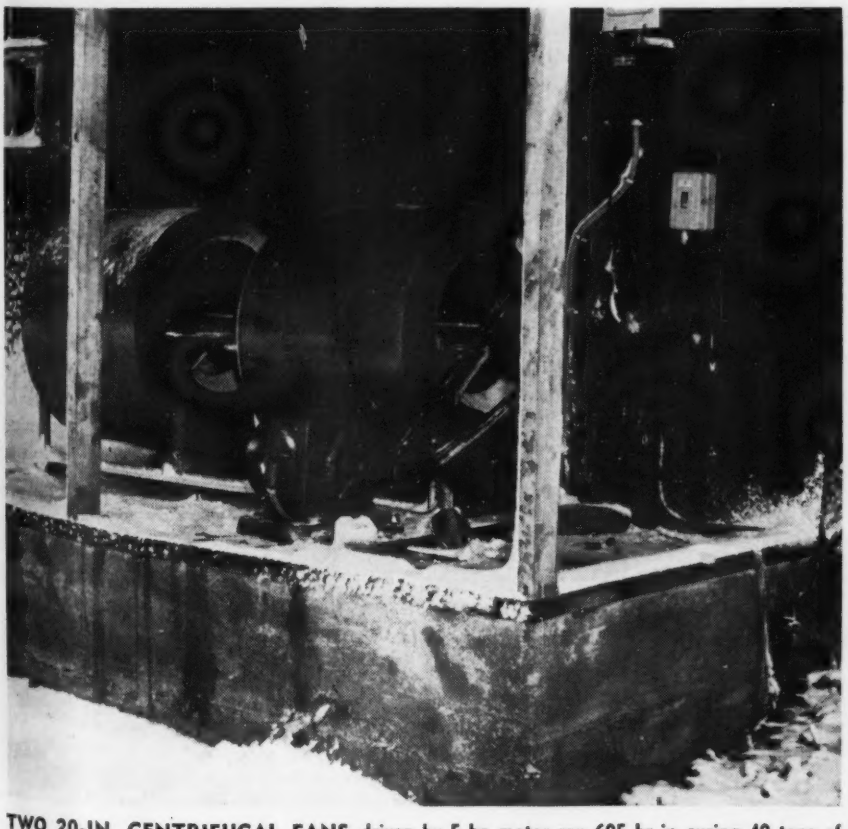


POT WITH HOUSING removed shows method of heater application. Pot is shown upside down in this illustration

• • •

Hay Curing Averages 60 Kwhr per Ton

MEASUREMENT OF ELECTRICAL requirements in hay curing showed decided benefits from this method at New Braintree, Mass. On the farm of W. Prescott Adams, service from the Gardner Electric Light Co handled the load. The mow consisted of 880 sq ft in two 20-ft x 22-ft sections. Floor and 6-ft sidewalls were made airtight by a covering of thick roofing paper. Two 21-in. American blowers driven by a 5-hp motor provided the air needed. The fans ran at 447 rpm, delivering 20,300 cfm at 0.5-in. static pressure.



TWO 20-IN. CENTRIFUGAL FANS driven by 5-hp motor ran 605 hr in curing 40 tons of hay. The fans ran at 447 rpm and delivered 20,300 cfm

A recording voltmeter, recording ammeter and a combination kw and kwhr meter were connected during the curing of the first 40 tons. The motor was rated at 23 amps and operated at 220 v. The maximum recorded demand was 19.2 amps. The energy consumption for 40 tons curing was 2,400 kwhr, or 60 kwhr per ton. The fans ran 605 hr. It is planned to improve this installation in 1948, providing for a more efficient air flow. Supports for the hay will be rearranged and the entrance duct enlarged to accommodate a greater hay capacity.

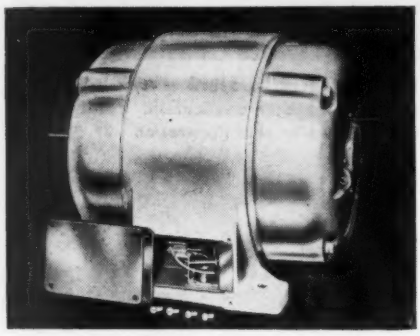
Production Increased

This winter the hay is being fed to the best Adams milk producers. A substantial increase in production and a marked lowering of grain feeds are expected. The motor is available for general farm chores. It is expected that the installation will pay for itself in 3 to 4 years. The owner did the construction work himself, and spent about $1,000 for equipment and wiring. This resulted in a considerable saving in construction costs.

NEW EQUIPMENT

General-Purpose Motors

THREE NEW LINES of general-purpose electric motors, called Permamotors, are being offered by A. O. Smith Corp, Milwaukee 1, Wis. Frames have NEMA mounting dimensions. Outside finish is aluminum hammer tone. Rotors are squirrel cage type.



Fractional horsepower motors are capacitor-start, single-phase type, with a 3-part switch and governor. They are available in 56 and 66 frames with bronze sleeve or ball bearings.

Integral horsepower single-phase motors are capacitor-start type, available in 1 to 5 hp ratings in 203, 204, 224 and 225 frames. Rotors with cast fan blades are shrunk on shaft. Capacitor in starting winding is cut out by enclosed voltage relay mounted between motor feet. See illustration.

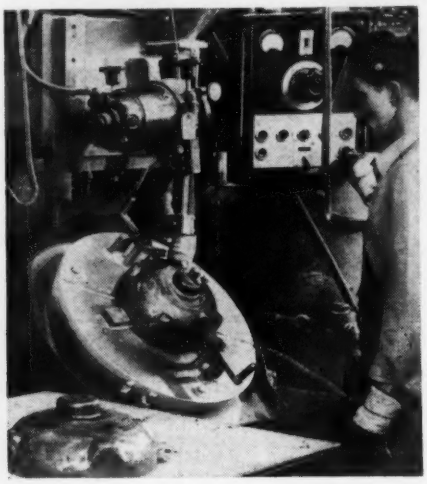
Polyphase squirrel cage motors are available in 203 to 326 frames, with protection against dripping moisture. Ball bearings are interchangeable, permitting shaft extension from either or both ends of motor. One-piece die cast rotor has fans cast to end rings. Cooling air is drawn into motor by fan blades and directed by spun aluminum deflector to stator coils.

•

Automatic Welder

A SINGLE PACKAGE for automatic welding—welding head, control equipmen, welding transformer and work positioning equipment—is available from Westinghouse Electric Corp, East Pittsburgh, Pa. It is known as the Weldomatic welder.

The standard Weldomatic head, suitable for welding with alternating or direct current, operates with a capacity of 1200 amp a-c and 800 amp d-c. The



head can be rotated 360 deg in the vertical or horizontal plane. Wires accommodated are $\frac{1}{8}$, $\frac{5}{32}$, $\frac{3}{16}$ and $\frac{1}{4}$ in. in diameter and feed is automatic. Speed of the driving motor is controlled by the burn off rate of the welding wire.

The motor-generator set is driven by a 2-hp, 220/440-v, 3-phase, 60-cycle motor. A 2-pole constant-potential generator supplies the control current and a 2-pole variable-voltage generator supplies current to the driving motor in the head. Control relays and contactors are mounted in the control panel.

The work positioning equipment is supplied as needed for the job from semi-standard designs of: travel carriages; mounting pedestal; rotator; positioner; and turning rolls.

•

Soldering Gun

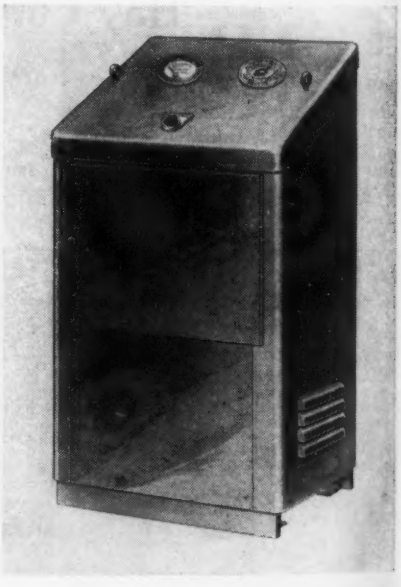
FEATURES of a new soldering tool are the tip which may be flexed to suit the work, and the spotlight which keeps the work in view. This soldering gun is a product of Weller Manufacturing Co, Easton, Pa. The small light,

placed between the terminals of the loop tip, goes on automatically when the current is turned on for soldering.

The gun can be used for work on electrical meter and instrument circuits, control circuits, in motor repair shops, laboratories and light manufacturing. It is reported to be suitable for intermittent service because it requires only 5 sec for heating. The tool operates on 110-v, 60-cycle circuits only. One model has a single heat of 100 w; another model has dual heat, 100 w normal heat and 135 w for short-time intermittent use.

•

Battery Charger



A NEW MOTOR-DRIVEN battery-charging unit designed for charging 6-cell lead-acid, and 10-cell Edison batteries has been added to the line of General Electric battery-charging equipment. Starting, charging, and shut-down are performed automatically by the new unit, which is reported to meet all Industrial Truck Association standards for 8-hr charging periods.

The motor-generator set and controls are contained in a cabinet 34 in. high, 24½ in. wide, and 12 in. deep. On a sloping top are mounted the timer, ammeter, and control switch for manual or automatic operation. A door in the front opens into a storage cabinet.

Beneath the storage space are the m-g set and controls, which are venti-

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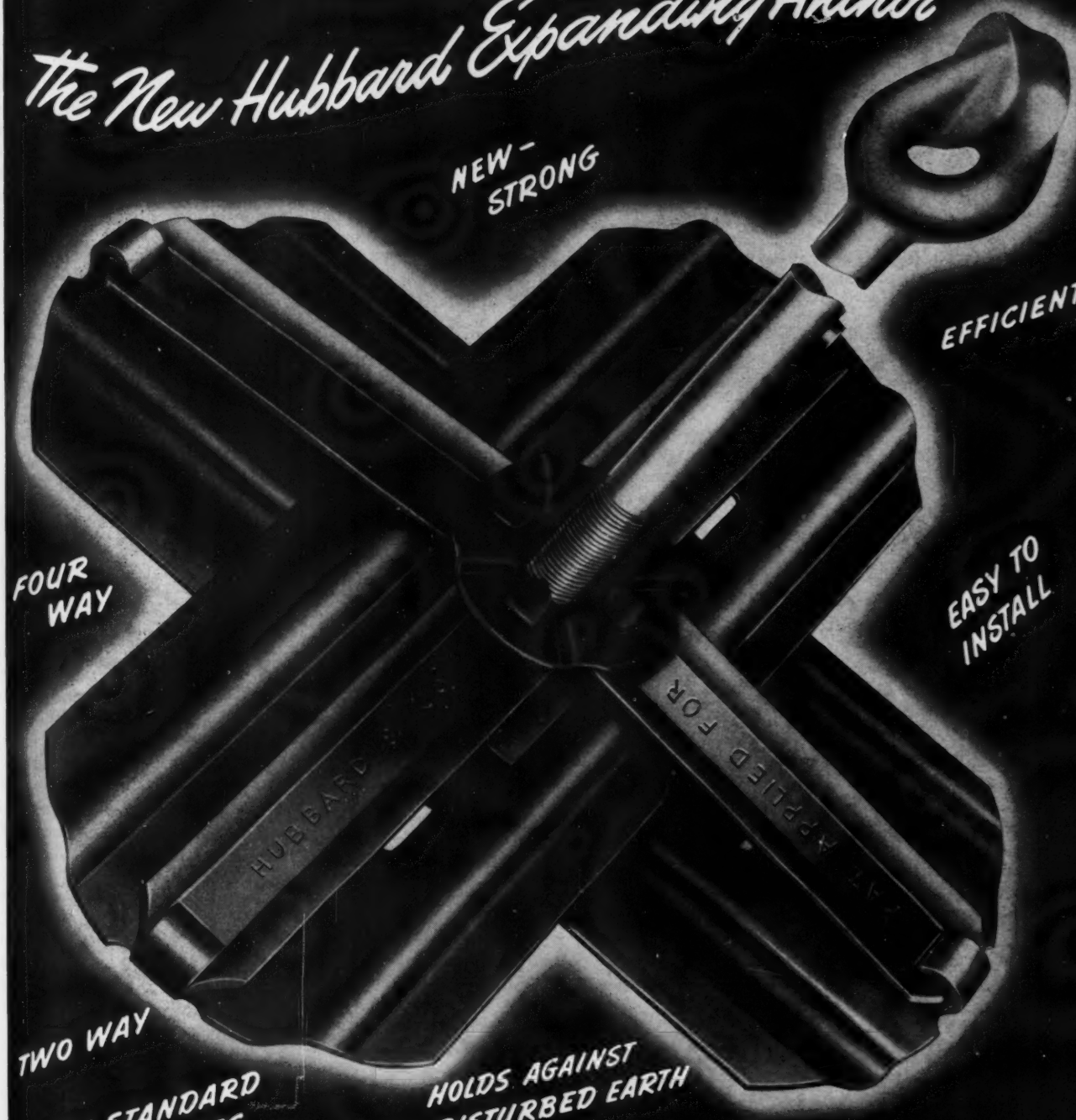

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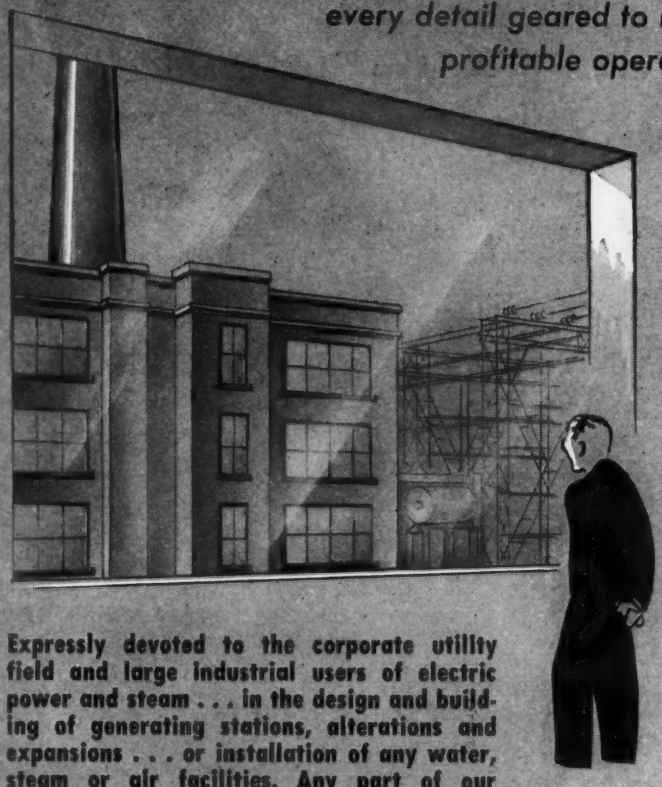

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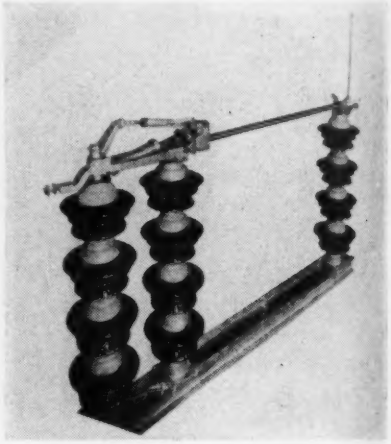
lated by louvers located in the sides of the steel enclosure. Lifting eyes on either side of the top make the charger easy to handle.

The new unit is assembled and wired by the manufacturer. It can be used on 220-, or 440-, 3-phase, 60-cycle power supply.

•

Disconnecting Switches

A NEW LINE of group-operated disconnecting switches for 115- to 230-kv outdoor service has been announced by the Switchgear Divisions of the General Electric Co. Designated Type RF, the new switch features silver-to-silver line-pressure contacts, a simplified operating mechanism, and complete elimination of current-carrying braids.



Main contacts close under a controlled pressure which is said to eliminate unnecessary scoring and excessive wear of the contacts.

The enclosed blade rotating mechanism is designed to permit over-travel of the rotating insulator stack without causing additional rotation of the blade. This eliminates any necessity for critical adjustment of the main operating mechanism.

Main moving parts of the switch are equipped with anti-friction bearings, and the blade is fully counter-balanced for all positions. The switch can be furnished for mounting in other than the standard upright position if required.

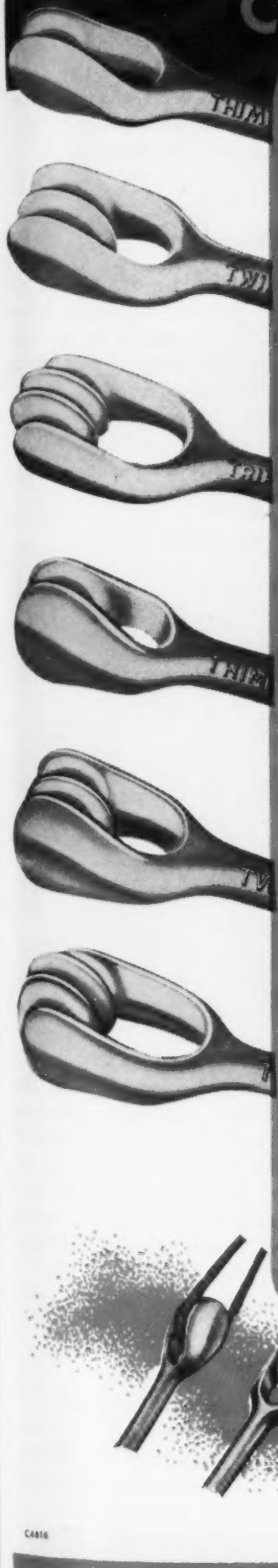
•

Charge Recycling Control

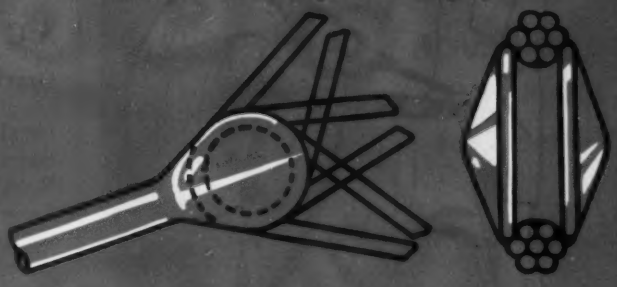
TO CHARGE TWO BATTERIES (lead or Edison type) in sequence and designed to operate in conjunction with the company's industrial truck battery chargers, an automatic recycling control has been made available by Federal Telephone and Radio Corp., Clifton, N. J.

Overall dimensions are 12 in. high, 9¾ in. wide, 6 in. deep. The unit

You Get Extra Strand Protection with CHANCE Improved Thimbleye Rods

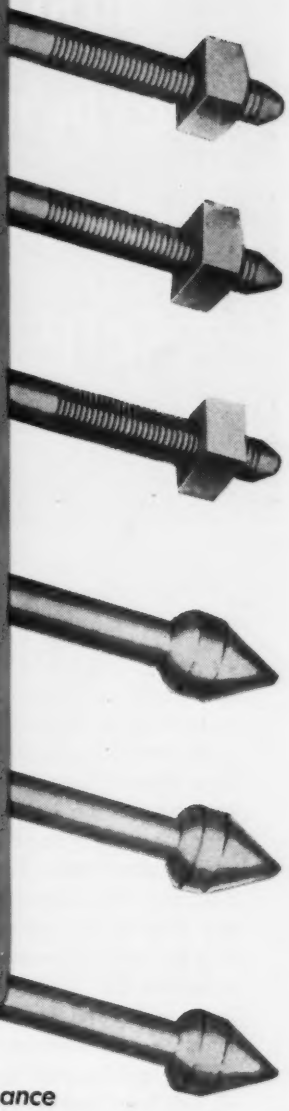


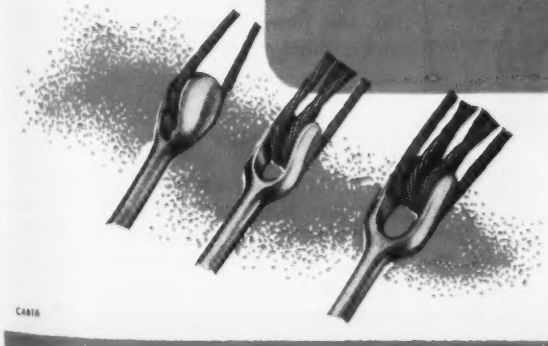
Full rounded to prevent kinking at any angle. Grooved to fit and protect guy strand.



Chance Thimbleye, Twineye, and Tripleye Anchor Rods and Guying Fixtures, which have been the first choice of users for years, are especially designed to protect the guy strand at various angles. The improved eye forms a perfectly shaped "Thimble" and the sidewalls and groove of the eye extend around the head of the rod, as shown in the diagram above. This keeps the strand from flattening under tension, preserves its cylindrical shape and prevents it from kinking at any one point. All grooves conform, in depth and width, to the largest cable size used with each rod or guy fixture.

All rods and fixtures are drop forged of steel and are heavily galvanized. Both Never-Creep and threaded rods are available with the improved Thimbleye, Twineye, or Tripleye for use with one, two, or three strands of cable.





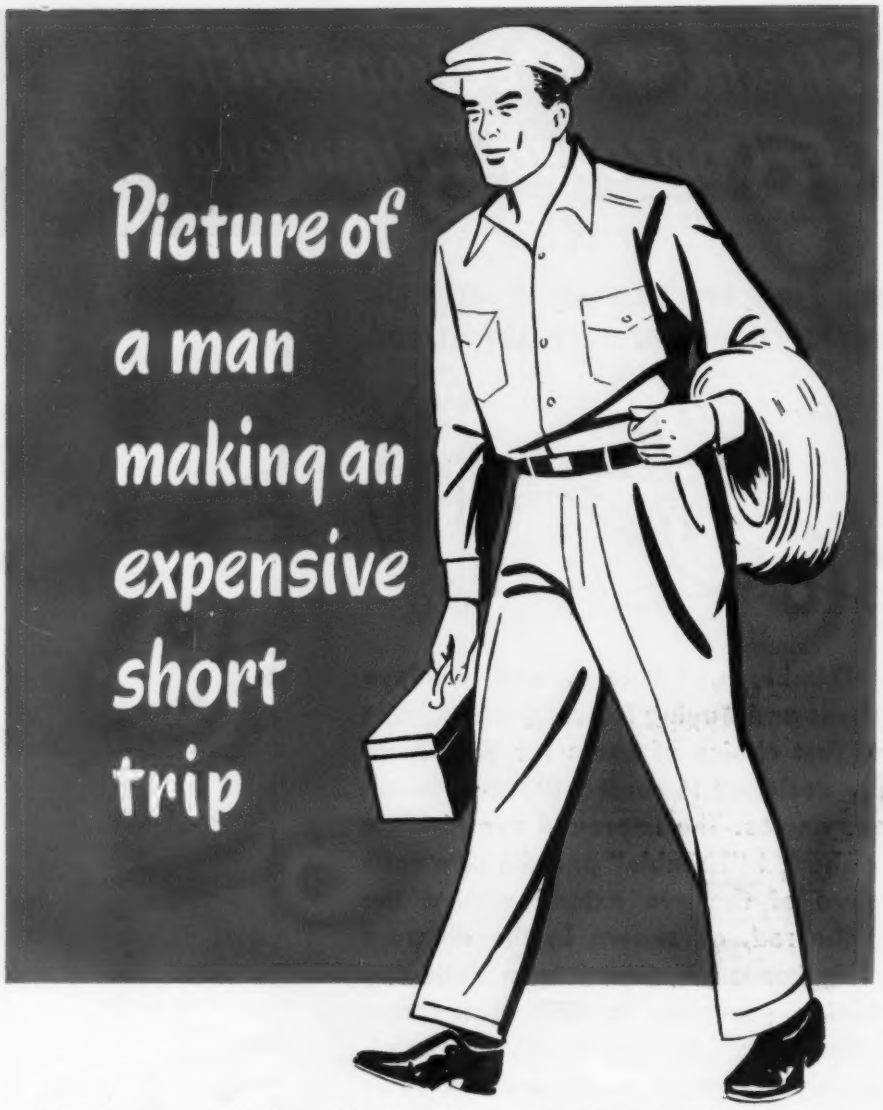
For greater line security *specify Chance Thimbleye* Anchor Rods to *get these latest improvements.*

CA816

A·B·CHANCE CO·

CENTRALIA, MISSOURI • SAN FRANCISCO, CALIFORNIA

ABC INDUSTRIES



It's going to cost $2.00 for this electrician to go to the machine he is to wire up. It is not a big job, but if it isn't done with tape that will last in spite of oil, water and acids, he'll be doing it again in a year or so. Why not fix it so there won't be any "next trip" to do the job over and cost another $2.00. Give your electrician No. 33 "SCOTCH" Electrical Tape with Vinyl Plastic Backing and he'll do any wiring job more quickly, because he'll be using only one tape instead of two tapes—rubber and friction. He'll do a neater job because No. 33 "SCOTCH" Electrical Tape doesn't bulk; only six one thousandths of an inch thick. He'll be doing a permanent job because No. 33 "SCOTCH" Electrical Tape with Vinyl Plastic Backing is unharmed by sunlight; water, fresh or salt; acids; alkalis; alcohols or oil. Ask for a free sample of No. 33 "SCOTCH" Tape and give it a trial.

REG. U.S. PAT. OFF.
No. 33 SCOTCH BRAND Electrical TAPE

WITH VINYL PLASTIC BACKING

ANOTHER 3M COMPANY PRODUCT

Made in U. S. A. by MINNESOTA MINING & MFG. CO. SAINT PAUL 6, MINNESOTA

can be mounted on a selenium battery charger. It contains a rheostat knob to be set for the number of cells to be charged, a timer dial, and a start push button.

After the first battery is charged, it is disconnected and the second battery is connected for a charge. After the second battery has been charged, the entire equipment is automatically disconnected from the a-c lines.

•

A-C Arc Welder

DEVELOPMENT of an a-c arc welder to supplement a line of industrial electrical equipment is made in an announcement by Mellaphone Electronic Rectifier Co, Inc, Rochester 2, N. Y. Known as the "Arcrite", this type T-250 operates on the moving-coil principle, providing continuous stepless current adjustment.

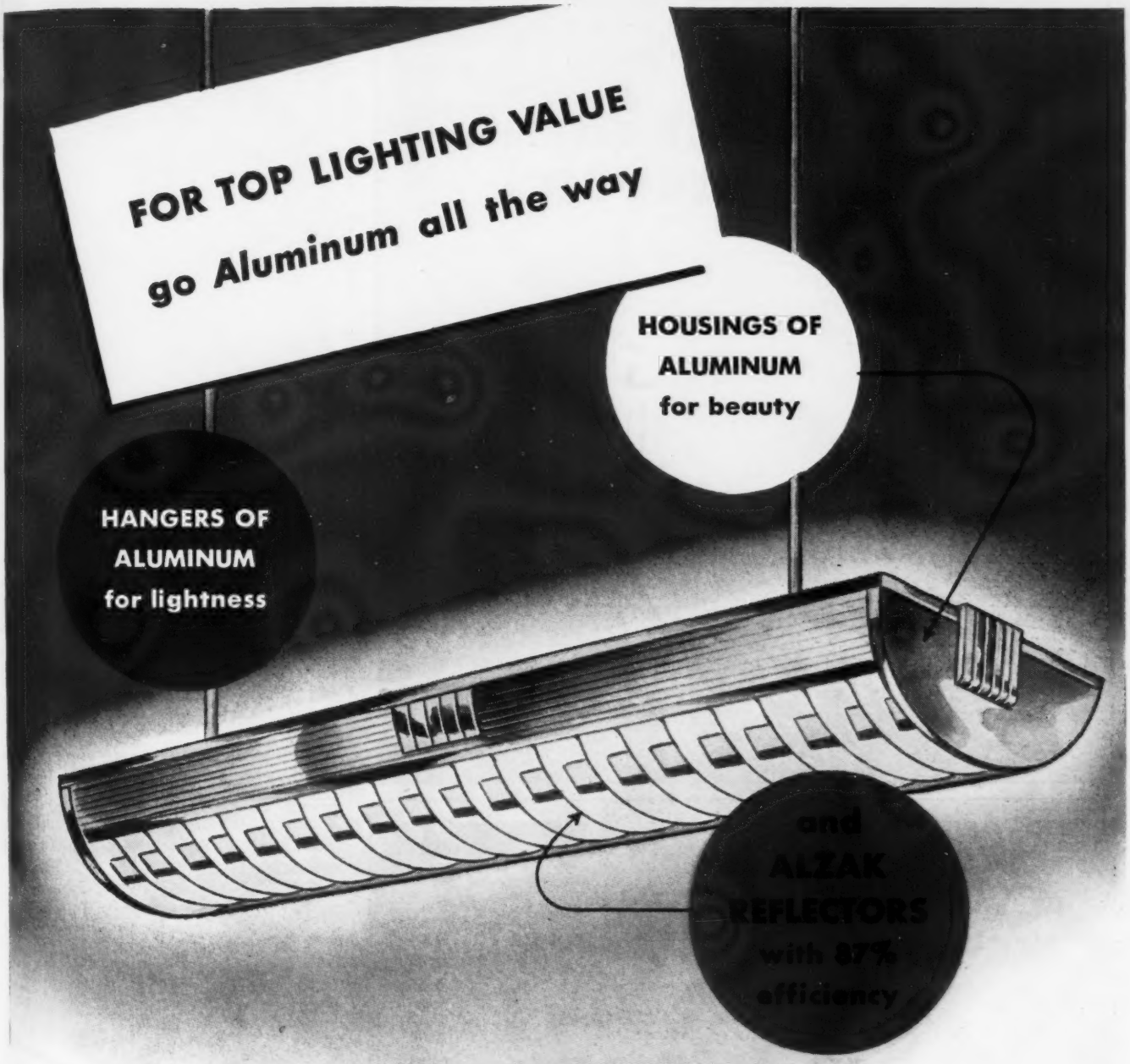
Welding current range is 25 to 250 amp. Transformer insulation is glass and mica, and windings are rectangular glass covered wire. Size is 18 in. x 18 in. x 37 in. Weight is 300 lb net. Accessories included are helmet, welding and power cables, electrode holder and ground clamp.

•

Psychrometer

AN ELECTRIC HUMIDITY measuring device has been announced by Minneapolis-Honeywell Regulator Co, Minneapolis, Minn. Temperature deviations are said to be read within one-fifth of a degree, it is reported. The motor-driven instrument uses matched wet and dry-bulb thermometers with scale readings from 40 to 120 F.

Called an aspirating psychrometer, the new device could be used as a standard check for other humidity instruments, for constant temperature rooms, for spot checks, in research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And order your Alzak Reflectors equipped with lightweight Alcoa Aluminum Housings and Tubular Hangers . . . they lessen the dead weight on ceilings and joists. Stay bright and attractive without painting or plating.

You can get Alzak Reflectors from leading lighting manufacturers . . . don't forget to specify "ALZAK". For names of manufacturers of Alzak Reflectors, write to ALUMINUM COMPANY OF AMERICA, 1978 Gulf Bldg., Pittsburgh 19, Pa. Sales offices in 54 leading cities.

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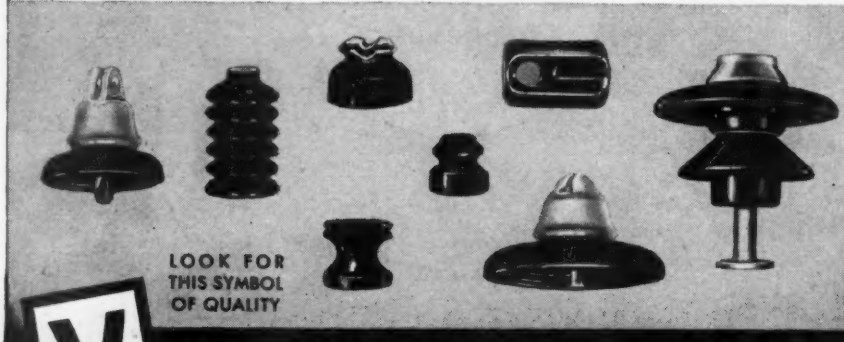
For DEPENDABLE Insulators Specify VICTOR

HIGH tension porcelain insulators made at Victor have passed the most *severe* tests on countless types of installations during the past 50 years. For safety, service and satisfaction, specify "Victor." We are doing our utmost to maintain dependable deliveries.



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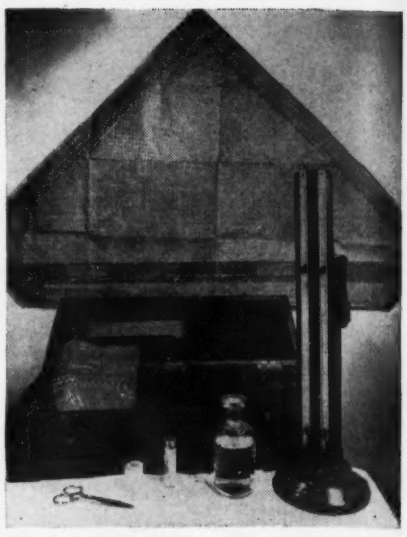
Self contained. Compact and portable. Direct reading in ohms. Simple push button operation. Measures resistance independently of auxiliary rod resistance. Unaffected by stray A.C. or D.C. potentials in ground area under test. Two models to meet all conditions. Model 255 for substation and ground mat testing. Four ranges, O-3, O-30, O-300 and O-3000 ohms; Model 251 for average conditions. Three ranges, O-12.5, O-125 and O-1250 ohms. Write for Bulletin No. 104. *Also available:* "Vibrotest" insulation resistance tester—"Hypot" insulation breakdown tester—Cable fault locators—soil resistivity meters—limits bridges—ammeters—ohmmeters—current transformers.

ASSOCIATED RESEARCH, Incorporated

"Precision instruments since 1936"

221-C S. Green St. Chicago 7, Ill.



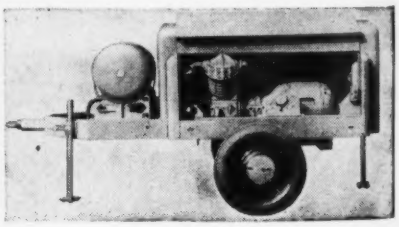
laboratories and dehydro frozen food industry.

Complete instrument includes a psychrometric chart, a wick, thread, scissors, a bottle of distilled water and carrying case. An adapter can be put over the thermometer bulbs so a tube can draw air from an enclosure by the psychrometer fan.

•

Portable Compressors

A LINE of electric portable compressors is being produced by Davey Compressor Co, Kent, Ohio. Known as Air Chief Electrics the units are available in skid, 2-wheel trailer and 4-wheel trailer mountings.



Compressors are 2-stage construction with intercooler and safety valve, and capacities are 60, 105, 160, 210 and 315 cfm, 125 lb maximum. They are driven directly by 1200 rpm, 220/440-v, 3-phase 60-cycle, squirrel-cage horizontal motors rated 15, 25, 40, 50 and 75 hp. Starters are full voltage, magnetic nonreversing, enclosed.

•

Snub Deadend

FOR USE ON ACSR without armor tape, a No. 420 snub deadend has been announced by Reliable Electric Co, 3145 Carroll Ave, Chicago 12, Ill. It is made of non-corrosive aluminum alloy and accommodates No. 2 or No. 4 conductors.

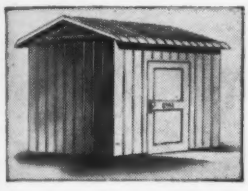
A hole is provided for attaching a sling which holds the deadend in position while the conductor is being

(Advertisement)

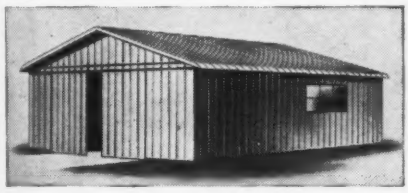
Butler Built Steel Buildings Now Packaged in Popular Sizes

Meet Urgent Demand for Low-Cost Quickly-Erected Commercial and Industrial Buildings

Solve your small-building problems *now* with a Butler Built Packaged Steel Building. Choose styles and sizes best suited to your needs from many different models. Erect them quickly — in just a few days — and move right in. Speedy, labor-saving erection is the result of unique bolt-together construction which skilled Butler engineers have developed and perfected. Buildings are easy to dismantle and re-erect with full salvage of materials.

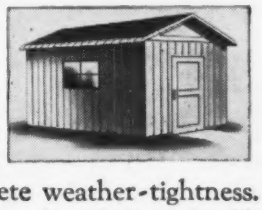


You save all down the line with Butler Built Packaged Steel Buildings. Fast production line methods hold costs to a minimum. Shipping costs are low because of compact packaging. Speedy erection saves you time and labor costs. Small upkeep expense means low overhead costs.



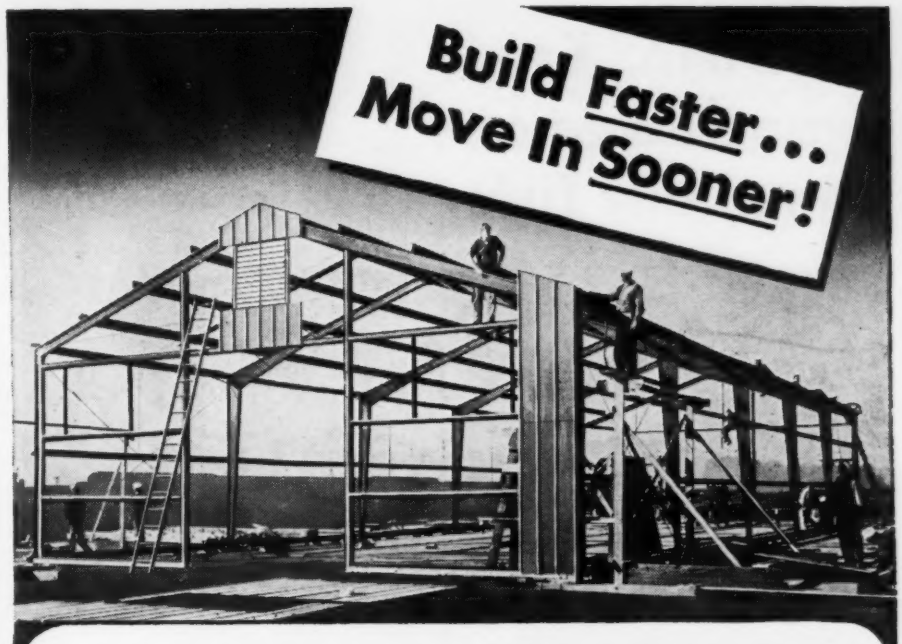
The adaptability of Butler Built Packaged Steel Buildings is practically unlimited. From the many basic styles, you will find a type to suit your requirements. If necessary, field modifications can be effected inexpensively by your contractor at the time of erection.

Deep drawn corrugated sheets of 24 gage galvanized steel form a waterproof covering for Butler Packaged Buildings. Each style of building is equipped with suitable doors and windows of sturdy galvanized steel. All are of extra-strength construction and fitted to insure complete weather-tightness.



Butler Built Packaged Steel Buildings are in production now, their quantity limited only by delivery of materials. Your nearest Butler dealer or distributor has full information on packaged steel buildings. See him today — or mail coupon for complete specification.

BUTLER MANUFACTURING COMPANY
Printed in U.S.A.



BUTLER BUILT
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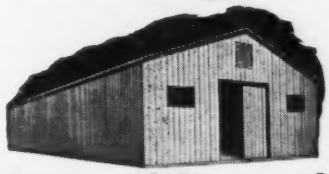
Steel Buildings — Aluminum Covered



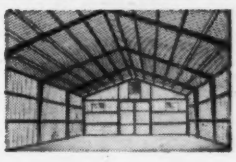
LOWER COST PER SQUARE FOOT

Erect and Occupy Them in a Few Days!

The ease and speed of erection of permanent, durable Butler buildings have solved the business "housing problem" for hundreds of manufacturers who want structures for diversified plant uses. Compare these features with buildings of other construction.

Users of Butler Steel Buildings effect real savings. First, in initial investment, because of the low cost per square foot of floor area; second, in low maintenance costs which continue through the years. Butler buildings are delivered in one compact shipment from one source. Savings in labor and handling charges are realized because Bulter factory fabrication makes erection simple and easy!

These Butler Steel Buildings are available in 40 ft. widths and lengths of any multiples of 20 ft. Also in 20 ft. and 32 ft. widths and lengths of any multiples of 12 feet.



See your nearest Butler dealer or distributor, or mail coupon below for complete information. Place your order at once for early delivery.

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Address Inquiries to:
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936 Sixth Ave. S. E., Minneapolis 14, Minn.

NAME _____

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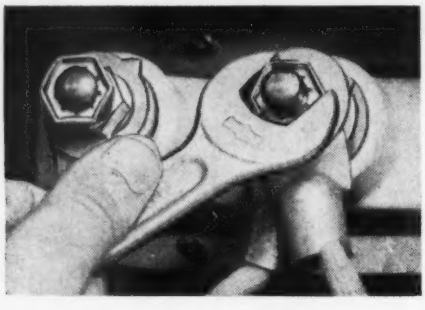
PALNUTS Keep Terminal connections Permanently Tight



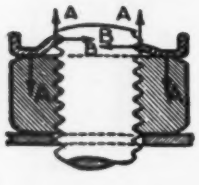
- *Perfect Conductivity*
- *No heating or corroding of contact surfaces*
- *Easy, speedy assembly*

"Palnuts" apply on TOP of the regular nuts, holding them to original tightness. Spring washers are eliminated between nut and terminal lug. There can be no backing off of nuts, nor opened spring washers to reduce contact. Instead, full conductivity of the entire nut seat is maintained under severest vibration.

Double-locking "Palnuts" are single thread locknuts, made of tempered spring steel or Duronze. They are easily, quickly spun on with the fingers and locked with 1/3 turn of a wrench. Require only 3 bolt threads space, are light in weight, low in cost, may be re-used.

"Palnuts" are available from stock for every utility requirement. Write for "Palnut" Manual giving engineering data.

Double Locking Action



Arched, slotted jaws grip the bolt like a chuck (B-B), while spring tension is exerted upward on the bolt threads and downward on the regular nut (A-A), securely locking both.

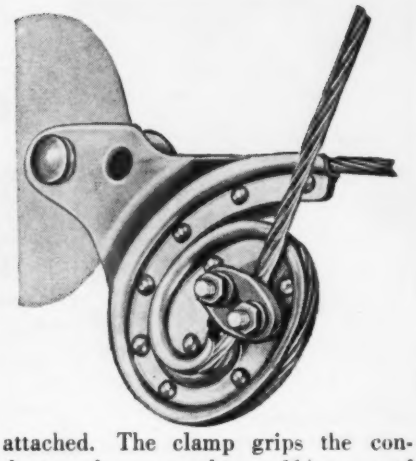
THE PALNUT COMPANY

51 Cordier St., Irvington 11, N. J.

DOUBLE-LOCKING

PALNUTS

Trademark Reg. U. S. Pat. Off.



attached. The clamp grips the conductor after more than a 1½ turns of snub.

•

Time Switch

A NEWLY DESIGNED compact time switch, approximately 3 in. wide, 5⅜ in. high and 3 in. deep, is introduced by the Sangamo Electric Co, Springfield, Illinois.

Designated as the type S time switch, it is powered by a recently developed high-torque, synchronous, self-starting, low-speed motor reported to be lubricated for life. The switch is designed for mounting on a standard switch box, or for surface mounting on any wall. It is available in two colors, ivory or brown.

•

Industrial Fixture

A NEW HEAVY duty, fluorescent industrial lighting unit that is said to eliminate socket breakage and falling lamps is announced by Mitchell Mfg Co, 2525 Clybourn Ave, Chicago 14, Ill. The model 2100 series has two 40-w lamps. It uses a newly developed, unbreakable "Twin Turret" lampholder that is said to hold lamps with

FIRE PAINTS BLACK PICTURES

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Aquatomic
FOG NOZZLES

fight fire with these four distinctive features:

1 Non-clogging—clear free-flowing passages without screens.

2 Maintain fog pattern—even at reduced pressures in emergency.

3 Deliver powerful fog—strike to base of fire in spite of drafts and air turbulence, indoors or outdoors.

4 Maximum cooling and quenching effect—finely atomized fog takes the heat out of burning gases, liquids or other combustibles.

Write for details.

Also—

Blaw-Knox offers Standard Wet and Dry Pipe Automatic Sprinkler Systems as well as Thermostatically Controlled Pre-Action and Deluge Systems.

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824 Beaver Avenue, N.S., Pittsburgh 12, Penna.

"Automatics"

BY

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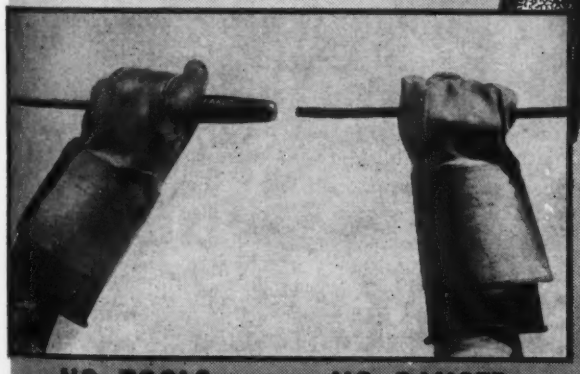

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R. E. A. APPROVED

CAST GROUND ROD CLAMPS

FULL SECURITY . . .

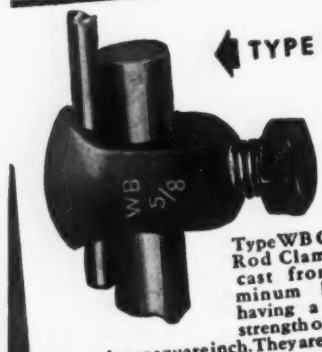
Weaver one-piece "firm-grip" clamps assure perfect alignment between rod and wire under high pressure.

AND DEPENDABILITY . . .

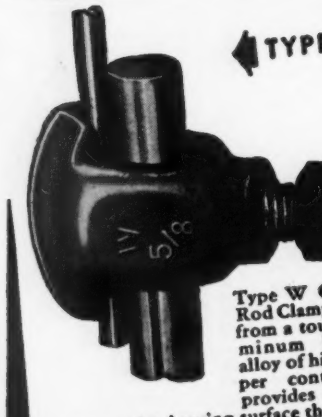
Cast of tough high tensile strength aluminum bronze to eliminate possibility of stretching, loosening and season cracking.

. . . AT LOWER COST

Weaver one-piece rod clamps, because of simplicity of design, not only do the job better but their cost is lower.

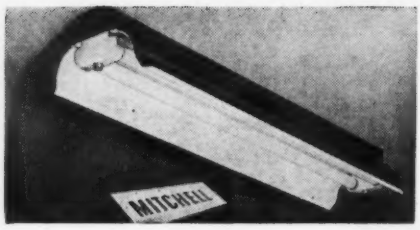


Type WB Ground Rod Clamps are cast from aluminum bronze having a tensile strength of 75,000 pounds per square inch. They are furnished with either large hexagon head or socket set screw. A cast ground rod clamp meets the need of better grounding at lower cost.



Type W Ground Rod Clamp is cast from a tough aluminum bronze alloy of high copper content. It provides a much larger, wire bearing surface than other types of ground rod clamps and approximately 30% more than type WB. Will not stretch or season crack even under most severe weather conditions.

J. A. WEAVER CO.
2110 HOWARD STREET
ST. LOUIS 6, MISSOURI



a positive grip regardless of vibration.

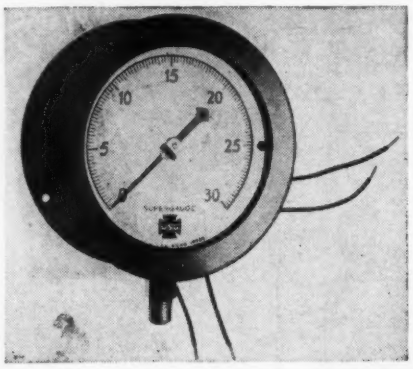
The unit is all-steel construction, mounts singly or end-to-end, flush or suspended, uses "brick type" ballasts, provides choice of baked or porcelain enamel reflector, and can be furnished with or without "instant-start" feature.

•

Pressure Switches

ADDITION of a type V and V1 switch to the company's line of pressure switches has been announced by the United States Gauge Division of American Machine and Metals, Inc, Sellersville, Pa.

These new units feature a switching differential of only 3% of full scale and have a capacity of 10 amp at 125 v a-c. The valves are available over the entire range from 30 in. of vacuum to 10,000 lb of pressure.



Both instruments are of similar functional design; however the type V1 has an extra Bourdon spring connected internally to the alarm spring to activate a conventional type indicator.

•

High Capacity Contactors

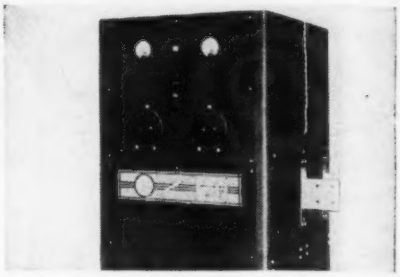
LATEST ADDITIONS to a line of contractors are 1500, 3000 and 6000-amp units for operation on voltages up to 750 d-c being made by Allis-Chalmers Mfg Co, Milwaukee, Wis. They are single-pole, heavy-duty, magnetically operated frame-mounted, rear-connected contactors with up to eight heavy-duty, normally open or normally closed, double-break auxiliary interlock contacts.

Main contacts have arc tips which are said to force the arc out onto the ribs of the arc runners. The arc chute has a divider to help cool the arc. All parts of the contactor, including the main and auxiliary contacts, are readily accessible.

These new contactors are particularly adapted for frequent starting and control of large d-c motors such as are common in steel mill installations.

•

Selenium Rectifiers



A SERIES of selenium rectifiers with 36-position tap switch controls is an addition to the line produced by Richardson-Allen Corp, 15 West 20th St, New York, N. Y. The tap switches offer an economy that is advantageous to users who do not need extremely fine settings as provided by the company's step-less variable controls.

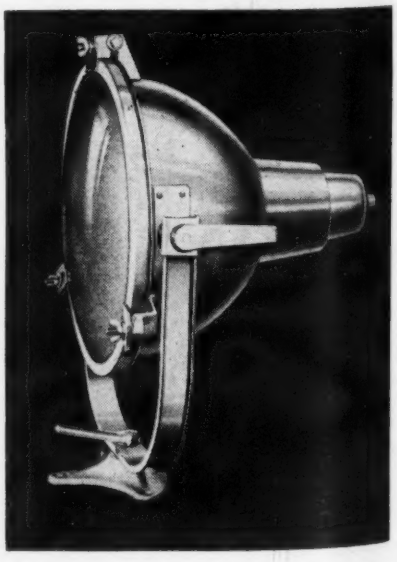
Units have two controls, 6 coarse taps and 6 fine taps. Finer voltage steps by 60 or 100 tap positions are available. The units include voltmeter, ammeter with shunt, 5000-hr pilot light, start and stop push buttons, and are standard up to 27 kw capacity.

•

Aluminum Floodlights

NEW WEATHERPROOF, aluminum floodlights are being produced by Pittsburgh Reflector Co, 410 Oliver Building, Pittsburgh 22, Pa. They are available in 200 to 1000-w lamp sizes.

Each unit is complete with a silvered-glass Permaflector and a convex heat-resisting glass lens. Lens diameters range from 8⅜ to 18¾ in. Housings are spun from sheet aluminum.



NEWS ABOUT PEOPLE

A-C Makes Assignments in Steam Turbine Dept

E. H. Horstman and Hans P. Dahlstrand have been named chief engineer and director of engineering respectively of the Allis-Chalmers steam turbine department.

Formerly assistant chief engineer of that department, Mr Horstman assumes complete charge of steam turbine engineering. He has been with the company since 1923, joining the steam turbine department after completing the company's graduate training course. From 1942 to 1945 he engaged in field engineering under the direction of Edwin H. Brown, vice-president in charge of engineering development. While on a leave of absence from A-C during part of 1945 and 1946, he served as a scientific consultant for the United States government in the capacity of investigator of power plant equipment in Germany.

Mr Dahlstrand has been associated with A-C since 1904, and has held the

E. H. Horstman

positions of engineer-in-charge, chief engineer, and more recently consulting engineer of the company's steam turbine department. A recognized authority on steam turbines, he holds many patents and has contributed outstanding improvements in steam turbine design. He is a fellow of ASME and has been active in other national engineering societies.

Announcement was also made by

H. P. Dahlstrand

Allis-Chalmers of the retirement of A. F. Rolf, an assistant secretary of the company for more than 25 years and associated with the company's New York district office for nearly 45 years. Mr Rolf joined the Bullock Electric Manufacturing Co, Cincinnati, Ohio, in 1899. In 1903 he entered the company's New York office, remaining there when A-C took over Bullock the following year. He was named New York district office manager in 1919 and served in that capacity until 1945.

L. E. Bogen and Nathan Wilkinson, two veterans of more than 40 years of service with A-C, have also retired. Mr Bogen became identified with Bullock in 1901 and in recent years has concentrated on waterwheel generators and synchronous condensers. Entering Bullock's employ in 1902, Mr Wilkinson has been an outstanding design engineer of dc machinery for many years.

•

▶ James C. Hall has resigned as assistant relay engineer of the Carolina Power Co at Raleigh to become superintendent of public utilities at Fayetteville, N. C. He is an electrical engineering graduate of North Carolina State College.

▶ Carl F. Bogenschutz has been named superintendent of the construction department of the Ft. Wayne (Ind.) municipal light and power works, to succeed Harry Pickett.

▶ Harvey K. Breckenridge has been elected a vice-president of West Penn Railways Co, Pittsburgh, Pa. Mr Breckenridge has been with the West Penn Companies since 1925 and was elected vice-president of the power company last May. Previous to that time, he had been assistant to the president and personnel director for West Penn Power and Railways Companies for eleven years, in charge of employee relations activities. Mr Breckenridge has served on many committees of the Pennsylvania Electric Association and is a member of the industrial relations committee of the Edison Electric Institute.

▶ J. C. Happenny, president of the Oklahoma Power & Water Co, Sand Springs, for the past nine years, has been named assistant to the vice-president in charge of operations of the Central Illinois Public Service Co, Springfield. Mr Happenny was treasurer of the Central Illinois Public Service Co from 1933 until 1939, when he resigned to become president of the Sand Springs utility, which recently was merged with the Public Service Co of Oklahoma.

▶ Stephen Freeman, Jr., a member of the electrical distribution department of the Consumers Power Co for the past 11 years, has severed his connection with that utility to become assistant professor of electrical engineering at Purdue University. Mr. Freeman was with the General Electric Co in Boston for three years and with a business concern in Wabash, Ind., for five years before joining Consumers Power.

▶ John J. Mangan has been appointed district engineer for the Upper Columbia district of the Bonneville Power Administration, with headquarters at Spokane. He succeeds Owen Hurd who resigned. Mangan has been serving with the BPA staff at Portland. He was formerly district engineer at Eugene, Ore.

▶ Roy C. Fosberg and Justin H. Ahrens have been appointed industrial power consultants in the sales department of the Hartford (Conn.) Electric Light Co. Fosberg joined the company in 1929 and has been engineering

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MARCUS AIR-COOLED TRANSFORMERS

There's no oil to burn or explode — no messy or toxic liquids — no need of a fireproof vault. In addition, *Marcus Air-Cooled Transformers* are economical — compact — efficient. They require only negligible attention or maintenance. Electrically, you can be assured of cool, continuous operation at rated capacity. Heatproof Class B (glass, mica, asbestos etc.) insulation withstands severest operating conditions.

Marcus Air-Cooled Transformers are available in sizes up to 500 KVA, single or three phase in voltages up to 13,200.

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assistant to the superintendent of distribution. Ahrens, with the utility since 1937, has been safety engineer.

▶ BRUCE CURRIE, manager at Nakusp for the British Columbia Power Commission, has moved to Yorkton, Sask., where he has accepted a position with the Saskatchewan Power & Light Commission. T. CARGILL, who arrived recently from England, has been appointed to succeed Currie at Nakusp.

▶ HERBERT WOTTRICH, who has been managerial assistant, electric department, since 1927, has been appointed assistant to general manager, electric department, Public Service Electric & Gas Co. Mr Wottrich started with Public Service in 1923 as a cadet engineer in the electric operating department.

▶ MYRIL B. REED, professor of electrical engineering, Illinois Institute of Technology, Chicago, has joined the University of Illinois at Urbana with the same rank. He is a graduate of the University of Colorado and of the University of Texas. He had been at Illinois Tech since 1938.

▶ MALCOLM M. HUBBARD has been made assistant director, Laboratory for Nuclear Science and Engineering, Massachusetts Institute of Technology. He received his electrical engineering degree from MIT in 1929. His professional career has been largely with the Bell Telephone System.

▶ ARTHUR W. COOMBS, New England sales manager of the Simplex Wire & Cable Co, Cambridge, Mass., has been elected a vice-president of the Tri-County Electric League, Portsmouth, N. H. He has also been made a director of the Electric Institute of Boston.

▶ MAJ GEN ROGER B. COLTON (retired) has been elected vice-president of the Federal Telephone & Radio Corp. Gen Colton, who has completed more than 30 years of service with the U. S. Army, has had extensive experience in communications research and development.

▶ JAMES DI ZEREGA has retired as manager of the Loudoun properties of the Virginia Electric & Power Co, after 24 years of service.

▶ F. H. JOHNSON has been appointed assistant chief engineer of Carnegie-Illinois Steel Corp. Pittsburgh, Pa. Mr Johnson was formerly chief engineer for the Chicago district of the company. He became identified with Carne-

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In baking heat where other insulations fail, Rockbestos A.V.C. wires and cables give you the *insured protection* you need.

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The cable illustrated and similar types rated up to 5000 volts assures trouble-free performance in hot locations, due to its unique construction:

- A tough, non-aging impregnated asbestos braid resistant to heat, flame, moisture, grease, oil and corrosive fumes.
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- Varnished cambric for high dielectric strength and added moisture resistance.
- An inner wall of heat and flame resistant impregnated asbestos which acts as a baffle between the varnished cambric and hot conductors.
- The conductor is perfectly and permanently centered in non-flowing heat resistant insulation that provides greater current carrying capacity.

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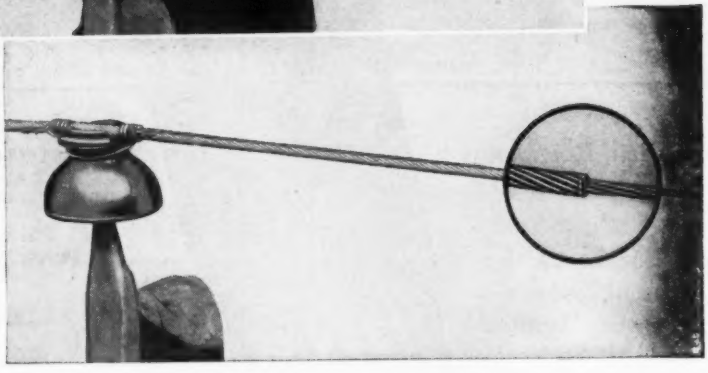

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Write for Descriptive Bulletin, No. PR-100.

INDIANA STEEL & WIRE COMPANY · MUNCIE, INDIANA

gie-Illinois in 1940 as an engineer at the South Works in Chicago. Previously he had spent 25 years in the steel industry with Minnesota Steel Co and Interlake Iron Corp.

▶ RODNEY CHASE has been elected vice-president in charge of public and industrial relations for the Chase Brass & Copper Co, Waterbury, Conn. Previously, he was director of these activities. Chase joined the company in 1920. After two years in shop work, he was made editor of the company's first house organ and first advertising manager of the company. Later he became assistant secretary and in 1941 was given the title director of public and industrial relations.

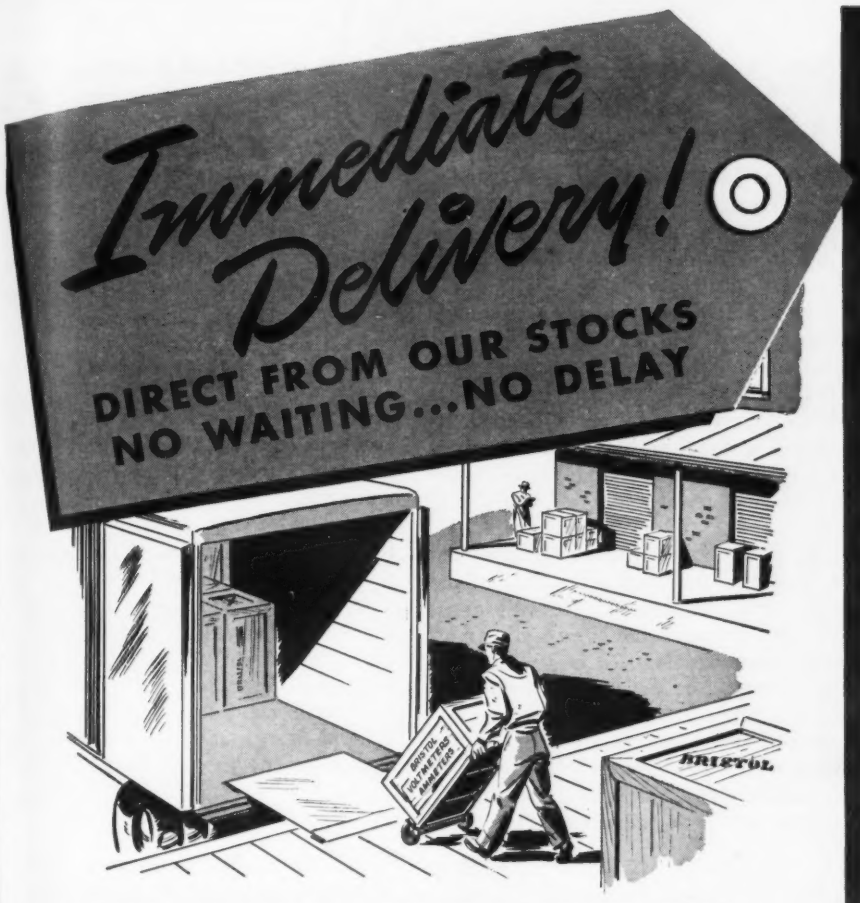
▶ L. B. SMITH, vice-president and director of the A. O. Smith Corp, Milwaukee, has been named general manager of the Kankakee Works. H. F. DETRICK, who has been manager, will now devote his full time to his duties as president of the Smith Meter Co, Los Angeles, a subsidiary.

▶ R. B. WILKINSON has been elected treasurer of Graybar Electric Co to succeed E. W. Shepard who will retire March 1. Wilkinson started with the company in 1915 as an errand boy. He has served as credit manager in Chicago and Pittsburgh. In June 1946, he became assistant treasurer with headquarters in New York. Shepard has been treasurer since 1926.

▶ G. F. CLIPSHAM has been made assistant to the president of the Lincoln Electric Co, Cleveland. A native of England, he came to the United States in 1924 to work as a design engineer. Clipsham joined Lincoln Electric in 1929 and returned to England in 1935 to organize the Lincoln Electric Co there. He was president of that firm until his recent return to this country.

▶ EAMONN D. A. GEOGHEGAN has been named factory manager of the Chicago plant of Solar Manufacturing Corp. He goes from the Tobe Deutschmann Corp, Canton, Mass., where he was chief engineer. He was previously connected with the Polymet Manufacturing Corp, Radio Corp of America, and Sprague Electric Co.

▶ ARTHUR F. HOFFMAN has been appointed comptroller of the A. G. Schoonmaker Co, Inc, power machinery company of New York. Mr Hoffman was formerly associated with the Electric Bond & Share Co and its subsidiary, Electric Power & Light Corp, where he completed 33 years of continuous



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Wall And Switch Board Model 540M

RANGE	CHART DRIVE	CONNECTION
90-130 volts	24 hr. spring or electric	back or bottom
90-140 volts	7 day electric	back
100-135 volts	7 day electric	back

Portable Model 522MSP*

90-130 volts	24 hr. spring or electric	side
90-130 / 180-260 volts	24 hr. spring or electric	side
90-140 / 180-280 volts	24 hr. electric	side

RECORDING AMMETERS

Wall And Switch Board Model 640M

RANGE	CHART DRIVE	CONNECTION
0-5 amps	24 hr. spring or electric	bottom
0-5 amps	7 day electric	back

Portable Model 622MP* and 622M

0-5 amps (622MP)	24 hr. spring	side
0-5 amps (622M)	24 hr. spring	side

*Equipped with weather-proof portable case and adjustable lugs for mounting on wall or pole. 622M similar, but not designed for wall or pole mounting.

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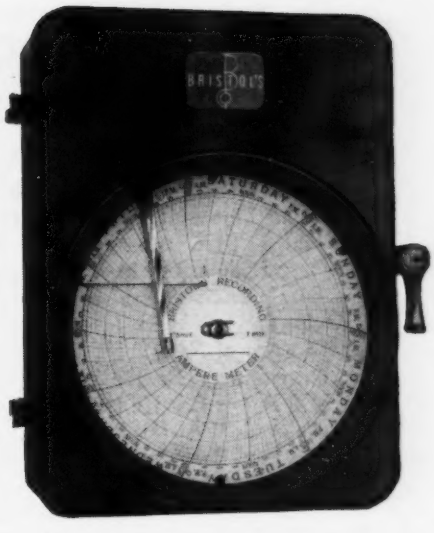
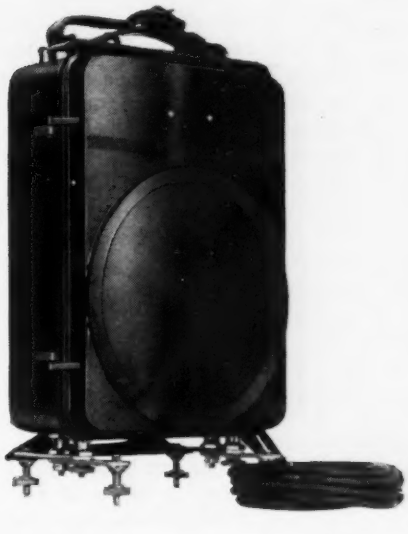


Bristol Recording Ammeter, Model 640M



Bristol Portable Recording Voltmeter, Model 522MSP

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service. During the past 12 years, he served as assistant secretary and treasurer of Electric Power & Light Corp and its subsidiary, United Gas Corp.

▶ DONALD R. E. BARNABY has been appointed assistant to the president of Canadian Line Materials, Ltd. He was graduated from Massachusetts Institute of Technology in 1938 with an electrical engineering degree. After working for two years for the TelAutograph Corp of New York, he was hired as an engineer by the Central Ohio Light & Power Co. He later worked for the Colorado Central Power Co. During the war, Barnaby was in the Navy. After the war he returned to the Central Ohio utility. He spent 25 months here before becoming affiliated with Canadian Line Materials.

▶ C. F. JENSKY has been appointed general sales manager of the Besler Corp, Emeryville, Calif., manufacturers of automatic steam generators, high-pressure pumps, and agricultural pest-control equipment. Temporarily, Mr Jensky will devote his full time to the steam generator and pump divisions of the corporation. One of this country's leading authorities on steam and its application to turbines, he was formerly general sales manager of Joshua Hendy Iron Works, and chief engineer and manager of the turbine department of Murray Iron Works Co.

▶ FRANK E. BROWN has been appointed merchandising manager of the Globe Lighting Products Co, New York. Mr Brown was formerly with the construction materials division of the General Electric Co at Bridgeport, Conn.

▶ BYRON M. FAST, industrial development engineer for Pennsylvania Electric Co, Johnstown, Pa., has retired after 37 years of service in public utility work. During the past five years he had been located in the central division with headquarters in Clearfield.

▶ R. G. ANDERSON has been appointed general manager of West Kootenay Power & Light Co. He joined the utility last year after serving with the Consolidated Mining & Smelting Co since 1923.

▶ P. W. STOUT has been appointed manager of the engineering service division of Canadian General Electric Co, Ltd, in Vancouver, B.C. He succeeds S. E. ERSKINE, now manager of the apparatus division.

New Appointments Made by General Electric Co

Announcement has been made by the General Electric Co of a new appointment in the executive unit and several appointments in the apparatus and appliance and merchandise units.

EDWIN J. KLOCK has been appointed manager of the market research division of the executive department. Engaged in market research work since 1926, Mr Klock formerly headed research groups in both the apparatus and the advertising and publicity departments.

F. K. MCCUNE has been appointed assistant to the general manager of the apparatus department. He will assist on administration and organization matters. Since joining GE in 1928 on the test course, Mr McCune has been connected with the commercial department of International General Electric, with the West Lynn works and with the Schenectady office as a member of the apparatus design engineering staff.

R. DAIL MOORE has been made manager, trade relations and special contracts. Mr Moore will assume the duties formerly performed by W. A. Sredenschek who recently was appointed assistant to Harry L. Erlicher, vice-president and general manager of the purchasing and traffic department. In addition to his new duties, Mr Moore will also have general supervision of sales training and the placement of technical sales personnel. He has been identified with GE since 1936.

JOHN F. CUNNINGHAM, assistant manager of manufacturing in the apparatus department, has retired after 46 years' service with the company.

CHARLES K. RIEGER has been appointed manager of the company's heating device and fan divisions, succeeding the late Marshall B. Ross. Mr Rieger joined GE in 1936 and before his new assignment served as commercial engineer in the home laundry equipment division.

MAURICE W. REID has been appointed manager of the Bridgeport Works, succeeding Carl M. Lynge, who will devote full time to his responsibilities as manager of manufacturing of the appliance and merchandise department. Mr Reid has been assistant general works manager in Bridgeport since 1946.

DONALD G. CAMERON has been named assistant to the manager, meter and instrument divisions, West Lynn Works. He joined the company in 1929 at Schenectady. Mr Cameron held various manufacturing executive posts at Lynn, leaving in 1944 to become chief engineer of the Penn Electric Switch Co, Goshen, Ind. He then became vice-president in charge of manufacturing and engineering and returned to GE in 1947.

GEORGE M. STEVENS, manager of the River Works, Lynn, Mass., has retired after 46 years with the company. He has been succeeded by Joseph F. Eckel, assistant manager of the River Works since 1945.

RICHARD H. RUDOLPH has been appointed sales manager of precision and laboratory test equipment and crystals for the specialty division at Electronics Park, Syracuse, N. Y. Formerly a commercial engineer in the division, he will now have charge of the sale of this equipment to nucleonic, research, and manufacturing organizations.

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▶ DR ZDENEK KOPAL has been named associate professor of computational analysis at the Massachusetts Institute of Technology. He is attached to the electrical engineering department. He has been research associate since 1946, specializing in large-scale computing equipment.

▶ L. L. ALEXANDER, manager of the Boone County Electric Cooperative, Columbia, Mo., has resigned. W. F. GERARD is now acting manager.

▶ PAUL H. MAURER, former executive engineer of Redmond Co, Inc, Owosso, Mich., has returned to the company after a three-year absence as director of engineering.

▶ P. VAN DEN BERG, vice-president and general manager of North American Philips Co, has been elected president.

▶ FLOYD L. KERNS, superintendent of the Peru, Ind., municipal light and water utilities since 1930, has resigned.

▶ IRVING J. HARRIS recently retired as construction engineer at Shasta Dam. WILLIAM J. MCCRYSTLE, Harris' chief aide, has been named acting construction engineer. Harris entered U. S. Reclamation Service employ in 1909, after nine years with southern California power companies, to serve as superintendent of construction on the Salt River project in Arizona. He supervised the building of the Roosevelt Dam power plant. From 1916 to 1933, he

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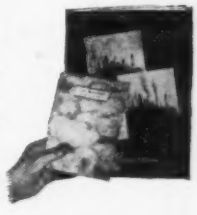

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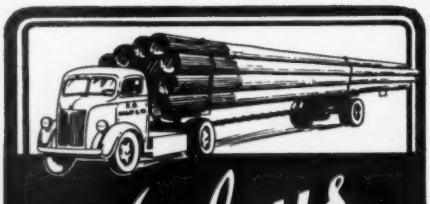

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was in private consulting practice. In 1933, he returned to Reclamation.

► H. L. Briggs, chief engineer of the Winnipeg Hydro-Electric System, has been made assistant general manager. He succeeds the late F. J. Malby. T. E. Storey has been promoted from principal to chief engineer.

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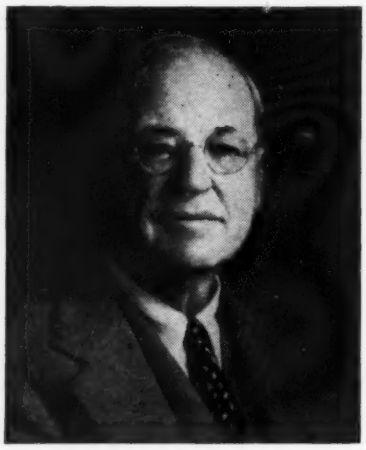
OBITUARY

Burton G. Tremaine

Burton G. Tremaine, co-founder of General Electric's Nela Park, located in Cleveland, Ohio, whose death was recently announced (EW, Feb 21, page 12), was one of the pioneers in electric lighting and a leader in that field for 45 years.



Born in Marine City, Mich., 84 years ago, Mr Tremaine organized the Fostoria (Ohio) Lamp Co in 1899, which in 1901 was combined with the Sunbeam Incandescent Lamp Co in Chicago.

Mr Tremaine, together with the late F. S. Terry, consolidated a group of companies into one body, which they called the National Electric Lamp Association, and as this association grew it attracted the attention of General Electric to whom it was later sold, becoming the National Lamp Works of GE. In 1911 Mr Tremaine was made co-manager with Mr Terry.

Their dream of a lighting center was realized in 1913 when Nela Park, named from the initials of the National Electric Lamp Association, was dedicated in East Cleveland. The beautifully landscaped grounds, looking more like a college campus with its Georgian buildings than a manufacturing company, was known as the "university of light." It is now the lamp department of General Electric.

In the early 1930's the lamp works was merged with GE's Edison Lamp Works in Harrison, N. J., to form the present lamp department and it was under Mr Tremaine's direction that

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STRONG & LIGHT—Uprights of 1½" x 9/16" x 3/16" open hearth channel—for *strength*—not weight. Arms of certified cast malleable iron have *double struts* that bear against the *flanges* of the channel rather than the thin web—for *proper* weight distribution.

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Stewart IRON and WIRE FENCES

epoch-making lighting developments made the Lighting Institute world-famous.

Mr Tremaine was made a director of GE in 1923 and later an honorary vice-president.

•

▶BUDD FRANKENFIELD, electrical engineer and author of engineering textbooks, died Feb 1, at his home in Los Angeles at the age of 75. Mr Frankenfield was a member of the first graduating class in electrical engineering at Standford University, in 1895. He later wrote a group of textbooks in his field and served on the faculties of the University of Wisconsin and Pennsylvania State University. His industrial affiliations included Westinghouse and Allis-Chalmers.

▶GLENN E. HOWE, 48, senior electrical engineer for the Southern California Edison Co, died Feb 1 in Los Angeles. He had been an Edison employee for 25 years.

▶WALTER H. WOOD, 72, service engineer with the Combustion Engineering Co, died suddenly on Feb 5 at Piqua, Ohio, of a heart attack. He was born in Arkansas and educated at the University of Arkansas. After varied employment, including 14 years as a consulting engineer in Philadelphia, he joined Combustion Engineering in 1917. He organized and headed the Test Department until he was transferred to service engineering in 1931.

▶JOHN D. MCKEE, 82, president of the California Oregon Power Co from 1920 to 1926, died Feb 6 at his home in San Francisco following a brief illness.

▶HARRY H. BUELL, Sacramento, Calif., northern area superintendent for Pacific Gas & Electric Co, died Jan 12. He was 61. He joined the utility following his graduation from Stanford University in 1909. He spent most time at San Jose where he was operating superintendent until 1944.

▶WENCEL H. HARTMAN, who retired in 1946 after 46 years of service with the Cleveland Electric Illuminating Co as purchasing agent, died Jan 31 at Cleveland. He was 66 years old.

▶CHARLES O. LINEBERRY, 58, superintendent of the Gorgas Plant of the Alabama Power Co since 1920, died Feb 7 of a heart attack. He went to the company from the Appalachian Electric Power Co.

TRANSFORMER TOPICS BY KUHLMAN — No. 2

The series of transformer problem questions and answers, included in Kuhlman Electric Co. advertisements of recent months, has proved so popular that it is presented here as a feature separate from our advertisement on the back cover of this magazine. We hope that our many friends, both old and new, will continue to find Transformer Topics informative and will send us their transformer problems for assistance.

Autotransformer Load Problem — An autotransformer is connected between the outside wires of a 220 volt, two-wire system to obtain 110/220 volt, three-wire system at the load. A load between one outside wire and the neutral requires 40 amperes at unity power factor, that between the other outside wire and the neutral takes 80 amperes at .8 power factor inductive. And a load between the outside lines requires 50 amperes at .7 power factor inductive. Note figure 1.

(a) What current flows in each of the line wires and in the neutral wire?
(b) What current flows in each winding of the transformer?
(c) What rating is required for the autotransformer parts?
(What rating appears on the nameplate of the transformer?)

Solution:

Load No. 1 = 40 amps. at unity Power Factor = 40 + j0 amps.
Load No. 2 = 80 amps. at .8 Power Factor = 80 (cos θ -j sin θ)
= 80 [(.8) — j.6] = 64 — j 48 amps.
Load No. 3 = 50 amps. at .7 Power Factor inductive
= 50 (cos θ — j sin θ) = 35 — j35.7 amps.

(a) I(Neutral) = I(for Load #2) — I(for Load #1) = 64 — j48 — 40 amps.
= 24 — j48 amps. = 53.7 amps.
I_1 = I(for Load #2) + I(for Load #3)
= (64 — j48) + (35 — j 35.6) amps. = 99 — j 83.6 = 130 amps.
I_2 = I(for Load #1) + I(for Load #3)
= 40 + (35 — j 35.7) = 75 — j35.7 = 83 amps.

(b) **Current flowing in transformer windings**
$I_N = 2I_T$
$I_T = \frac{I_N}{2} = \frac{24 - j48}{2} = 12 - j24$ amps. = 26.8 amps.
$I_{\text{Total Line}}$ = (75 — j35.7) + (12 — j24) =
87 — j 59.7 amps. = 105.5 amps.

(c) **Rating of autotransformer parts**

$$\text{KVA} = \frac{110 \text{ volts} \times 26.85 \text{ amps.}}{1000} = 2.95 \text{ KVA}$$

Nameplate rating

$$\text{KVA} = \frac{220 \text{ volts} \times 26.85 \text{ amps.}}{1000} = 5.90 \text{ KVA}$$

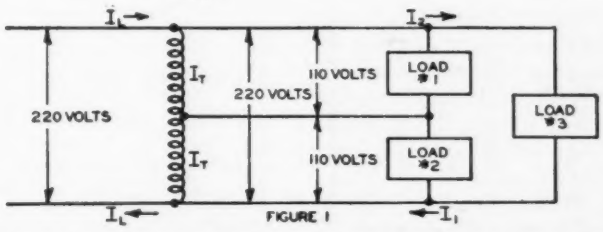

FIGURE 1

KUHLMAN ELECTRIC CO. • BAY CITY, MICHIGAN

BUY
all the U. S. Saving Bonds you can
and
KEEP
all the U. S. Saving Bonds you buy

Subox
ANTI-CORROSIVE PAINT
SUBALOX
LEAD & ALUMINUM PAINT
Simplify Maintenance
Give Maximum Protection
Subox, Inc.
NORTH ARLINGTON, N. J.

MANUFACTURERS & MARKETS

TECHNICAL ADVANTAGES of Preformed Armor Rods are pointed out to Ken R. Miller, left, by their inventor, Thomas F. Peterson

Preformed Line Products Opens Office in Cleveland

A new company, formed to conduct research and development of a new conductor armoring device called Preformed Armor Rods, has opened offices in the Bulkley Building, Cleveland. The company is operating as the Preformed Line Products Co.

Ken R. Miller, formerly with the Cleveland Electric Illuminating Co, will be sales manager. Inventor and patent owner of Preformed Armor Rods is Thomas F. Peterson.

The rods are merely wires of spring steel, aluminum, or copper. They are formed in open helicies with a uniform pitch of 8 to 12 times the diameter of the conductor upon which they are to be applied. The inside diameter of the helicies is slightly less than the outside diameter of the conductor.

The rods can be applied without tools or clamps and can be applied to either energized or de-energized lines. The rods can be used in guying, deadending, damping, splicing, conductor protection, and local conductor insulation.

The company is also interested in a synthetic resin conductor guard. It is preformed and is applied in the same manner as the rods. It is asserted that the guard is effective for protection and insulation of conductors passing through trees.

•

Confirms Reorganization Plan of Allied Control Co

Reorganization plan of the Allied Control Co, Inc, of New York and Connecticut, has been confirmed by the U. S. Federal Court in Chicago.

C. L. Von Egloffstein, engineer, has been elected president, James McDill controller, and J. K. Holbrook, Jr, secretary.

Executive offices of the company are located at 2 East End Av, New York 21, N. Y.

•

Plans $5,000,000 Plant

Maytag Co, Newton, Iowa, has announced that it will build a $5,000,000 factory to produce its new automatic washer. Fred Maytag II, president, said the company has an option on a tract in Des Moines and is considering sites in Newton and Cedar Rapids. "We expect to have the factory completed and washers coming off the production lines within a year," Mr Maytag stated.

GE Turbine Orders Now on Hand Total 9,500,000 Kw

General Electric Co now has orders for 9,500,000 kw of steam electric turbine-generators to be delivered within the next four years. Turbine-generators are now being built at the rate of 40,000 kw a week. When the new $20,000,000 turbine building at Schenectady is completed, this rate will be increased.

The average size of turbines has risen to about 50,000 kw, about 50 percent greater than a decade ago. General Electric expects to increase its production level for the next eight to ten years.

•

Wayne University to Give Audio-Visual Material Aid

Wayne University, Detroit, has established an Audio-Visual Materials Consultation Bureau to aid firms and associations in making films, booklets, charts, or specimen products available for school use. The bureau offers "one-stop" service. Surveys showing school needs, critical analysis of scripts and copy, and actual classroom try-out of materials in "rough" or finished form are types of help given.

The bureau also offers assistance in the development of films, film-strips, records, and manuals to be used for instructional purposes in industrial training programs.

Dr Arthur Stenius, 5272 Second Boulevard, Detroit 1, Mich., is in charge of the bureau.

•

Package Steam Units

The Foster Wheeler Corp has entered the field of package steam generators. The new units, ranging up to 27,000 lb per hour, are assembled at the factory, including refractory and insulation. Both oil and gas-fired designs are available. A coal-fired unit will be ready shortly.

•

Anaconda Cuts Prices

Anaconda Wire & Cable Co has cut the price of bare copper wire to 27.3 cents a pound for less than carload lots, a reduction of almost ⅛ cent. Weather-

proof copper wire is lowered by ¼ cent to 27.85 cents a pound for less than carload lots.

•

Woodward Governor Gets Second Safety Award

Woodward Governor Co, Rockford, Ill., has received a second accident prevention award from the Liberty Mutual Insurance Co in recognition of its continued outstanding industrial safety record. The first award was made to Woodward Governor in 1945 and as a result of the recent presentation the company becomes the fifth in the nation to receive a blue star to be added to its Liberty Mutual Accident Prevention flag.

Since the 1945 award, made for reduction of lost time accidents, the company has reduced such accidents by still another one-third.

•

Manufacturers Make New Sales Assignments

Electrical manufacturing companies have recently made the following appointments to their sales staffs:

Allis-Chalmers Mfg Co, Milwaukee, Wis., has appointed George H. Carden manager of the Baltimore district office and T. G. Smith resident representative at Beaumont, Tex. Mr Carden has been Washington district office sales representative since 1943 and Mr Smith was formerly sales representative in the company's New Orleans office.

General Controls Co, Glendale, Calif., has appointed E. B. Maire sales manager of the following midwestern, southern and eastern branch offices: Boston, Philadelphia, Pittsburgh, Birmingham, New York, Detroit, Cleveland and Chicago.

American Steel & Wire Co, Cleveland, Ohio, has appointed H. H. Bullen to a newly-created sales position covering 14 states. As western district electrical products sales manager, his territory includes Illinois, Indiana, Iowa, Wisconsin, Nebraska, Wyoming, Colorado, New Mexico, Minnesota, Montana, North Dakota, South Dakota, Missouri and Kansas. He will continue to maintain his headquarters in Chicago.

Bright Light Reflector Co, Bridgeport, Conn., has assigned Theodore O. Jorgensen to its New York sales office. Mr Jorgensen was formerly manager of the lighting division of the Consolidated Edison Co, New York.

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GE Sets Motor Record

General Electric Co produced more fractional hp motors in 1947 than in any previous year in the company's history.

Recent Rate Changes

Pennsylvania Power & Light Co rates to large commercial and industrial users of electric power in Harrisburg and other areas of the state, including electricity sold for resale purposes, have been increased with approval of the state Public Utility Commission. Higher rates became effective with commission approval of addition of a fuel adjustment clause to the utility's rate structure, which will vary the cost of electric power with the cost of other power-producing fuels. A number of commercial users filed complaints with the commission objecting to the proposed tariff change. While it approved the higher rates for industrial users, the PUC pointed out that "in no case will the bills of domestic and small commercial customers be increased."

Georgia Power & Light Co has filed a petition with the state Public Service Commission requesting a general rate increase. Authority is sought for a general boost of 10.57 percent for domestic and small commercial users. The increase for large industrial users, cities and rural electric co-ops would be 0.54 cents per kilowatthour. The company is seeking the increase under the "inflation adjustment" clause which permits the company to advance its rates as the cost of fuel oil increases. The Georgia utility purchases power from Florida Power Corp, the parent company, which uses fuel oil to generate 93.5 percent of its power.

Mississippi Power Co is reducing its overall electric rates by approximately 7 to 8 percent in the 23 counties it serves. This will cover urban and rural residential and commercial electric service and provides substantial savings. New rates will become effective April 1. These new schedules will provide a general rate adjustment totaling approximately $400,000 a year to more than 65,000 customers and will be applicable throughout the entire area served, L. P. Sweatt, president, announced. Mr. Sweatt pointed to the growth in the territory and the increase in power use from 152 million to 354 million kwhr since 1939.

Long Island Lighting Co and its subsidiaries, the Queens Borough Gas & Electric Co and the Nassau and Suffolk Lighting Co, have been permitted by the New York Public Service Commission to file applications for interim increases in gas rates of $2,325,000 annually. At the same time, the decision said that the Long Island and the Queens Borough companies had to reduce their electric rates by at least $500,000 a year. Meanwhile, hearings will be continued for further examination of the system companies' rates and other matters. Edward F. Barrett, president of Long Island Lighting, stated that the gas companies in the group will file interim gas and electric rate adjustment applications with a request that the new rates be made effective immediately. He said that there would be a "substantial" reduction in electric bills for the system companies.

•

Open New Chicago Offices

Withers & Ropek, engineers, have announced the opening of new offices at 2400 West Madison St, Chicago 12, Ill.

Protection for

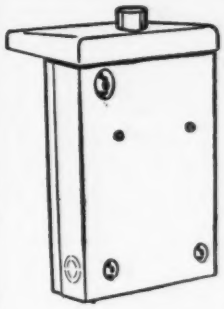
METERS AND METERING CONNECTIONS

with

KEES OUTDOOR METER BOXES

Designed to give *complete* protection, and to insure quick installation and servicing of outdoor meters.

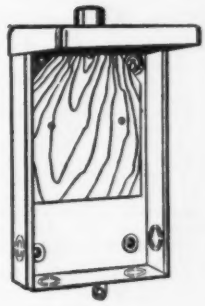
WEATHERPROOF Safety



All cover joints overlap. Top cover is a solid, one-piece stamping . . . no joints to allow leaking.

TAMPERPROOF Safety

Front cover is held in place by concealed lugs and a latch which may be sealed or padlocked. Attempts at tampering are easily detected.



PROTECTION is the keynote of KEES Outdoor Meter Boxes. Select the boxes you need from four standard sizes, all with the exclusive KEES safety features.

WRITE FOR CATALOG TODAY

KEES

F. D. KEES MANUFACTURING CO.

Beatrice, Nebraska

NEW ELECTRICAL CONSTRUCTION

A weekly selection of U. S. electrical construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is indicated or implied

UTILITIES

Proposed Construction

Arizona—Bureau Reclamation, Dpt. Interior, Bldg. 1A, Denver Federal Center, Denver, Colo., one 115,000 volt circuit breaker, two 115,000 volt disconnecting switches, and 3 current transformers, Spec. 2121; 2 battery chargers and control equip., Spec. 2123, for Tucson Substation, Kingman, Davis Dam Project. W. R. Young, Bldg. 1A, Denver Federal Center, Denver, Colo., ch. engr.

California—Bureau Reclamation, Dpt. Interior, Building 1-A, Denver Federal Center, Denver, Colo., one spar runner for 40,000 hp. turbines at Parker Power Plant, Parker Dam Proj., Spec. 2117.

D. C., Wash.—Pub. Bldgs. Admin., Federal Wks. Agency Bldg., X-radiation Lab. and addn to high voltage annex at National Bureau of Standards. S-4160A, appr. No. 13X 0643, Proj. 49-1002-SA-AE.

Idaho—Bureau Reclamation, Dpt. Interior, Bldg. 1A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Lewiston, 1 horizontal transverse paddle-type flocculator, 2 vertical paddle-type flocculators, circular-tank-type clarifier, 1 rectangular-tank, drag-conveyor-type clarifier, one circular-tank-type combined flocculator and clarifier, 1 mechanical mixer, 2 dry-chemical feeders, 1 basin level regulator, 2 rate-of-flow controllers, 4 operating tables, four 4- to 10-in waste valves, four 10 wash valves, sludge pump, one chlorinator, 1 ammoniator for Lewiston Orchards Water Treatment Plant, Lewiston Orchards Proj. Spec. 2124. Walker R. Young, Denver, Colo., ch. engr.

Ia., Seymour—City, light and power plant sys. imprvs., incl. generating unit, wiring, cooling tower, bldg. construction, etc. **$75,000.** R. W. Gearhart, 349 21 St., Cedar Rapids, engr.

Montana—Bureau Reclamation, Dpt. Interior, Hungry Horse Government Camp, Columbia Falls, Hungry Horse Dam, 520 ft. high, 2,115 ft. long, 3,000,000 cu. yd. concrete, incl. power plant, on south fork of Flathead River, 9 mi. southeast of Columbia Falls.

Neb., Fremont—City, power plant imprvs., incl. 2 transformers and turbine with necessary plant structures. **$125,000.** L. M. Roessler, city engr.

Pennsylvania—Dpt. Forests & Waters, 404 Education Bldg., Harrisburg, electric power equip., materials and construction, Proj. 4, in Schuylkill River desilting work. **$600,000.** Plans deposit $10. Schuylkill River Project Engineers, 20 S. 15 St., Phila., Zone 2, engrs.

Tennessee—City of Lafollette, 188 mi. rural power lines, in Campbell and Claiborne Counties. Wm. M. Wilson, Shelbyville, engr.

Tex., Austin—City, Walter E. Seaholm, dir. Utilities, electrical plant. **$2,500,000;** electric power sub-station, **$300,000;** electric power distr. lines. **$300,000.**

W. Va., Wheeling—Wheeling Electric Co., 51 16 St., 1 and 2 story, approx. 500x800 ft., brick, concrete block transmission sub-station, 42 and Wetzell Sts. **$500,000.**

Wyoming—Bureau Reclamation, Dpt. Interior, Building 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Casper, one motor-driven, two stage, duplex-stationary, or vertical V-type air compressor; one motor-driven, single-stage, straight-line, stationary air compressor; one portable, motor-driven, two-stage air compressor; two aftercoolers and two air receivers for Kortes Powerplant, Kortes Unit, Missouri Basin Proj., Spec. 2120.

Low Bidders & Contracts Awarded

Ia., Harlan—City, Bd. Trustee Electric Light & Power Plant, L. D. Billings, secy., Harlan, imprv. municipal electric light and power plant, incl. diesel engine generating unit, exciter, miscellaneous equip. and services, to Fulton Iron Works Co., 1259 Delaware St., St. Louis, 14, Mo. **$188,728.** Bids 2/4.

Minn., Owatonna—City, Gladys Phelps, clk., Owatonna, furnishing, installing 4,000 kw. turbo generator, 6,000 sq. ft. surface condenser and auxiliary equip., in municipal power plant, to Westinghouse Electric Supply Co., 253 E. 4 St., St. Paul. **$202,500.** Bids 1/20.

Neb., Lincoln—City, general contract power plant imprvs., to Ernest Rokahr & Son, 2241 Y St., Lincoln, **$84,818;** power piping, breeching, ducts and stack, coal and ash handling equip., insulation and boiler, to Winger Constr. Co., 1200 E. Main St., Ottumwa, Ia. **$147,700.** Bids 2/4.

N. Y., New York—New York Daily News, 220 E. 42 St., Station WPIX, 200 ft. tower on top of 36 story Daily News Bldg., to Turner Constr. Co., 420 Lexington Ave., Zone 17. Alexander D. Crosett & Assoc., 27 Williams St., engrs and archts.

Pa., Clarks Summit—Dpt. Property & Supplies, Harrisburg, replacement boiler plant and facilities at Clarks Summit State Hospital. **$644,875.** John P. Gilboy, Bowman Bldg., Scranton, consult, engr. A. F. Jones, c/o owner, ch. engr.

Tex., San Antonio—City Public Service Bd., 201 N. St. Marys St., design and construction electric generating plant, Quintana Rd. and Leon Creek and electric generating plant and new electric turbgenerator power plant, to Gibbs & Hill, Inc., Penn. Station, New York, 1, N. Y. Approx. **$3,830,000.**

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

S. C., Charleston—Medical College of State of South Carolina, c/o Hopkins & Baker, Florence, and Samuel Hannaford & Son, Dixie Terminal Bldg., Cincinnati, O., archts., hospital. **$4,000,000.**

Tex., Bayton—Humble Oil & Refining Co., Baytown, expansion refinery, **$16,000,000;** expansion, modernization mechanical shops, **$2,500,000;** plans by Nunn & McGinty, 2017 W. Gray St., locker rooms, **$75,000.**

Low Bidders & Contracts Awarded

Ga., Decatur—Twin Oaks Apartments, c/o E. Wolz, archt., 611 Standard Bldg., Atlanta, 212 apartment units. Owner builds. **$2,000,000.**

Ky., Calvert City—Pennsylvania Salt Mfg. Co., Widner Bldg., Phila., Pa., fluorine chemical plant, incl. shop and administration bldgs, to Early Constr. Co., 321 Middle Waterway, Tacona 3, Wash. **$3,000,000.** J. W. McWhirter Co., c/o owner, dir. constr.

Pa., Wilkes-Barre—U. S. Eng., P.O. Box 1715, Baltimore 3, Md., Feb. 17, veterans hospital for Veterans Admin., Vermont Ave. between H and I Sts. N.W., Wash. 25, D. C., from Merritt-Chapman & Scott, 17 Battery Pl., New York 4, N. Y., main bldg. **$7,734,918;** main bldg., incl. mechanical and electrical work and outside utilities, **$11,230,468;** constructing quarters, **$607,000*****from McBride Co., 160 Ward St., Paterson, N. J., mechanical work, **$1,967,732*****from Howard P. Foley, 2107 N. 6 St., Harrisburg, electrical work, **$786,000*****from Westinghouse Electric Corp., 150 Pacific Ave., Jersey City, N. J., elevators, **$269,760*****from Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, elevated steel water tank, **$66,500.**

Tenn., Memphis—The John Gaston Hospital, c/o Walk C. Jones & Walk C. Jones, Jr., archts., 1215 Poplar Ave., alterations, addns. to maternity division of hospital to Consolidated Contractors, 1489 Thomas St. **$846,939.**

SEARCHLIGHT SECTION

(Classified Advertising)

Employment : : Equipment
Business : : Used or Resale
"OPPORTUNITIES"

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(Not available for equipment advertising)

90c a line, minimum 4 lines.
To figure advance payment count 5 average words as a line.

Positions Wanted (full or part time salaried employment only), ½ the above rates payable in advance.

Box Numbers—Care of publication New York, Chicago or San Francisco offices count as one line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

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Individual Spaces with border rules for prominent display of advertisements.

The advertising rate is $8.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.

MECHANICAL DESIGN ENGINEER
With Administrative Experience
in the Design of Steam Electric Stations
Preferably Between 35 and 45 Years of Age
LARGE EASTERN UTILITY
All Replies Strictly Confidential
P-3325, Electrical World
330 West 42nd Street, New York 18, N. Y.

REFINERY INSTRUMENT MECHANIC

Should be fully experienced in maintenance and repair of all types of oil refinery instruments including flow controllers, temperature and pressure regulators, etc. Write, giving outline of previous experience, as well as complete personal information to:

ASHLAND OIL & REFINING COMPANY
Employment Department
1409 Winchester Avenue — Ashland, Kentucky

WANTED
DESIGNERS, CHECKERS
ELECTRICAL ENGINEERS
with Power Plant Design Experience
CORBETT, TINGHIR & CO.
15 Moore St. — New York 4, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

GRADUATE ELECTRICAL Engineer required by a well known electric utility in Northwestern Ohio. Man with technical background such that he can be trained for supervision of distribution, maintenance, and electrical construction. Long range program with good opportunity for advancement. Write full particulars about age, experience and training, and salary requirements to P-3450, Electrical World.

A WELL-KNOWN electrical manufacturing company, recognized nationally, needs Distribution and Power Transformer Engineers. In reply to this ad include in background information, education, experience and salary expected. P-3705, Electrical World.

Additional Employment Advertising on page 128